

1.0 A-Train Integrated CALIPSO, CloudSat, CERES, MODIS merged product (CCCM, C3M)

The a-train integrated CALIPSO, CloudSat, CERES, and MODIS merged product (CCCM) contains retrieved cloud and aerosol properties from CALIPSO, CloudSat and MODIS over their ground track. These retrieved values from the instantaneous radiance or from lidar and radar signals are collocated with near nadir view of Clouds and the Earth's Radiant Energy System (CERES) instrument's footprints. The product also contains CERES derived top-of-atmosphere (TOA) irradiances, vertical profiles of shortwave (SW), longwave (LW), and window (WN) modeled irradiances. The horizontal length of the CERES footprint is approximately 20 km. The product is available by daily files.

Three different sets of cloud and aerosol retrieved properties are included. Those three sets are:

- 1) Cloud and aerosol properties derived from MODIS only by the algorithm that is similar to the CERES cloud algorithms Edition 4. The data structure of the product follows exactly the same format of CERES SSF and CRS products. Therefore, cloud properties for up to 2 non-overlapping clouds for the entire CERES footprint are included (except for variables from SSF-114a through SSF-114k). The irradiances are computed 5 atmospheric levels including TOA and the surface.
- 2) The best estimate of the vertical profile of cloud and aerosol properties derived from CALIPSO, and CloudSat. Note that the retrieval is limited to over the ground track of CALIPSO and CloudSat. Therefore, profiles cover only a small part of a CERES footprint. The vertical resolution of the retrieved cloud and aerosol properties closely follows the original CALIPSO and CloudSat data.

MODIS-derived cloud and aerosol properties along the ground track of CALIPSO and CloudSat are also included in order to provide the information of the spatial variability of clouds and aerosols over a CERES footprint when these are compared with cloud and aerosol properties cover the entire footprint from 1).

- 3) Cloud and aerosol properties derived from the enhanced CERES cloud algorithm. The enhanced algorithm uses cloud mask and height derived from CALIPSO and CloudSat to improve the accuracy of the cloud property retrieval. Cloud and aerosol properties that are derived from MODIS radiances cover either the entire CERES footprint or along the ground track. For this version, the enhanced algorithm is only applied to radiances over the CALIPSO and CloudSat ground track so that cloud properties from the enhanced algorithm covering the whole footprint contain a default value.

Roughly, the product begins with SSF variables followed by CRS variables. Variables derived from CALIPSO and CloudSat are included after SSF and CRS variables.

Descriptions of CALIPSO and CloudSat cloud and aerosol properties

CALIPSO and CloudSat properties are sorted into 1 km horizontal bins (1 km pixels). The vertical resolution of cloud mask is the same as the CALIPSO vertical feature mask resolution, 30 m below 8.2 km and 60 m above 8.2 km. Table 1 describes the cloud merging strategy and it is briefly explained below.

When either CALIPSO or CloudSat detects a cloud layer:

The cloud layer is kept.

When both CALIPSO and CloudSat detect a cloud layer:

Cloud top: Either from CALIPSO or CloudSat whichever reports a higher cloud top height

Cloud base: When CALIPSO signal is not attenuated, use the CALIPSO cloud base.

When CALIPSO signal is completely attenuated,

The cloud base is provided by CloudSat if CloudSat detected the cloud below the complete attenuation level. If CloudSat missed the cloud, the complete attenuation level is used for the cloud base height.

Table 1: Cloud top and base merging strategy

Cloud boundary	CALIPSO	CloudSat	Merged Cloud boundary
Top	Detected	Detected	Higher cloud top
Top	Detected	Undetected	CALIPSO cloud top
Top	Undetected	Detected	CloudSat cloud top
Base	Not completely attenuated	Undetected	CALIPSO cloud base
Base	Not completely attenuated	Detected	CALIPSO cloud base
Base	Totally attenuated	Detected	CloudSat cloud base
Base	Totally attenuated	Undetected	CALIPSO lowest unattenuated base

If CloudSat derived cloud boundary is within 480 m from CALIPSO derived cloud boundary, CALIPSO derived cloud boundary is used. When CloudSat detected a cloud layer that was separated by a clear-sky layer depth of which is smaller than 480 m from CALIPSO detected cloud layers, the CloudSat detected cloud layer is considered the same cloud as the CALIPSO detected cloud layers. Clouds profiles are further sorted. Profiles that have the same vertical cloud structure (cloud top and base height, as well as number of overlapping cloud layers) are grouped together, as shown in Figure 1. After the grouping process, the cloud fraction of each cloud group along the ground track of CALIPSO and CloudSat is computed.

The product keeps up to 16 cloud groups (i.e. 16 different sets of cloud boundaries) in a CERES footprint. For each cloud group, there are up to 6 separate cloud overlapping layers. The cloud group that has the largest PSF weighted coverage (i.e. the groups that have the same cloud overlapping structure have a coverage calculated and these are ranked ordered, hence the largest cloud fraction) within a CERES footprint is reported first in the file.

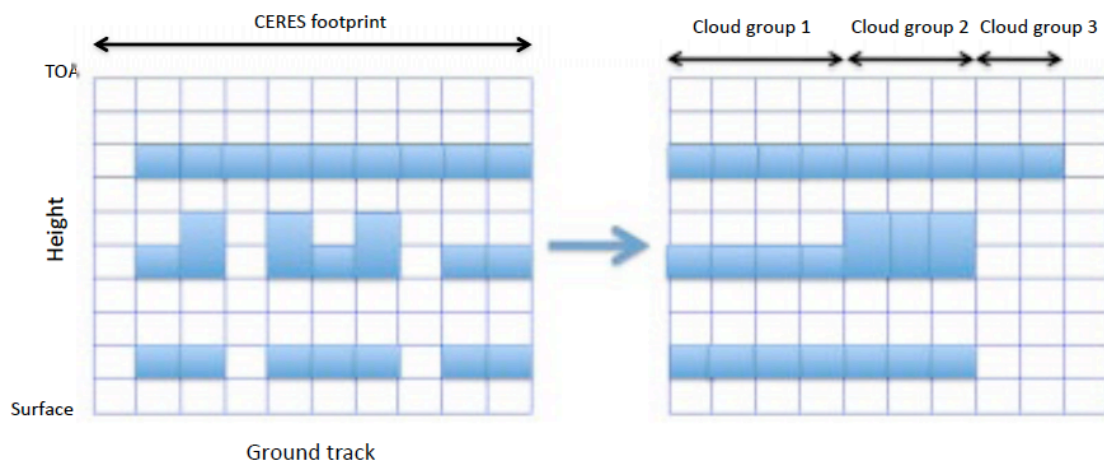


Figure 1: Schematic of the cloud grouping process. Cloud profiles that occur within a CERES footprint and have the same cloud boundary heights are grouped together. The group number of 1 is assigned to the cloud group having the largest cloud fraction over a CERES footprint.

Example case (shown in Figure 2):

Figure 2 shows hypothetical cloud layers over the ground track of CALIPSO and CloudSat in a CERES footprint after the sorting process shown in Figure 1 is applied.

The left most column: Clear fraction of 10%

Second from the left most column: one-layer cloud (cloud fraction = 20%)

Third from the left most column: three-layer clouds (cloud fraction = 20%)

Fourth from the left most column: four layer clouds (cloud fraction = 30%)

The number of cloud groups (cloud overlap combinations) (m) for this case is 3 (i.e. $m=3$).

The number of overlapping layers p for the first, second and third cloud group is 1, 3, and 4, respectively.

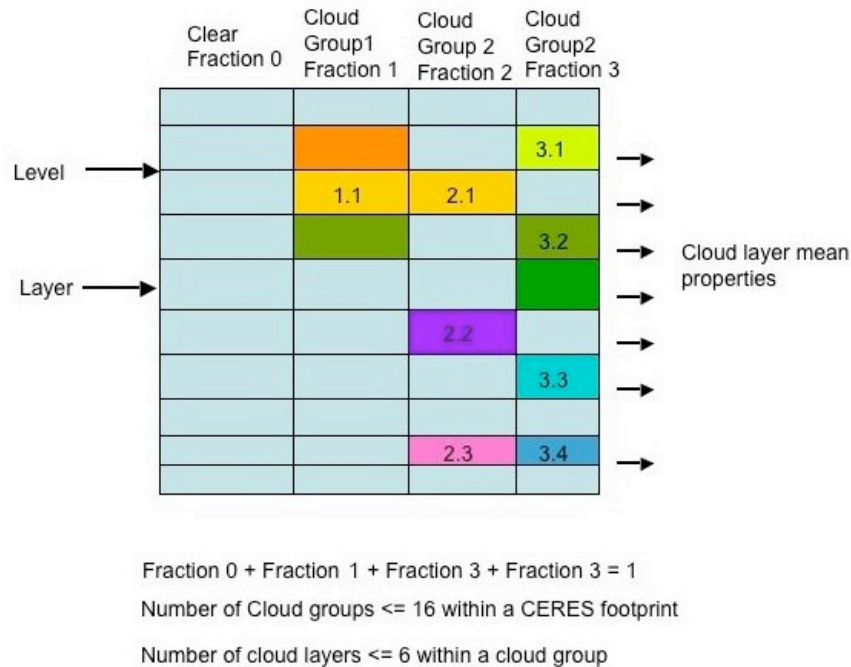


Figure 2. Hypothetical clouds over the CALIPSO and CloudSat ground track in a CERES footprint. Cloud layers in a cloud group are stored from the higher to lower altitudes as shown in this figure.

Level: 2

Frequency: Daily

Portion of Atmosphere Covered: the surface to 65 km

Portion of Globe Covered: Near nadir view only

File: Near Nadir Satellite Swath

Record: 1 CERES Footprint

Product Version:

Aqua: RelB1

SSF Metadata

Table 1.0-1 lists variables in the header in addition to variables that already in CERES SSF file.

The layer center height is the midlevel of each layer.

The layer boundaries are given by the level height.

Table 1.0-1. CCCM_Header

Item	Description	Units	Range	Elements	Bytes/ Elem
CCCM-H1	CCCM_id	N/A	118 or 1118	1	4
CCCM-H2	Character name of CERES instrument	N/A	ASCII string	1	4
CCCM-H3	Day and time at hour start	N/A	ASCII string	1	28
CCCM-H4	Character name of satellite	N/A	ASCII string	1	4
CCCM-H5	Character name of high resolution imager instrument	N/A	ASCII string	1	8
CCCM-H6	Number of imager channels	N/A	1 .. 20	1	4
CCCM-H7	Central wavelengths of imager channels	μm	0.4 .. 15.0	20	4
CCCM-H8	Earth-sun distance at hour start	AU	0.98 .. 1.02	1	4
CCCM-H9	Beta angle	deg	-90 .. 90	1	4
CCCM-H10	Co-latitude of subsatellite point at surface at hour start	deg	0 .. 180	1	4
CCCM-H11	Longitude of subsatellite point at surface at hour start	deg	0 .. 360	1	4
CCCM-H12	Co-latitude of subsatellite point at surface at hour end	deg	0 .. 180	1	4
CCCM-H13	Longitude of subsatellite point at surface at hour end	deg	0 .. 360	1	4
CCCM-H14	Along-track angle of satellite at hour end	deg	0 .. 330	1	4
CCCM-H15	Number of footprints in SSF product	N/A	0 .. 360000	1	4
CCCM-H16	Subsystem 4.1 identification string	N/A	ASCII string	1	128
CCCM-H17	Subsystem 4.2 identification string	N/A	ASCII string	1	128
CCCM-H18	Subsystem 4.3 identification string	N/A	ASCII string	1	128
CCCM-H19	Subsystem 4.4 identification string	N/A	ASCII string	1	128
CCCM-H20	Subsystem 4.5 identification string	N/A	ASCII string	1	128
CCCM-H21	Subsystem 4.6 identification string	N/A	ASCII string	1	128
CCCM-H22	IES production date and time	N/A	ASCII string	1	24
CCCM-H23	MOA production date and time	N/A	ASCII string	1	24
CCCM-H24	SSF production date and time	N/A	ASCII string	1	24

CCCM-H25	Spare real	N/A	real	1	4
CCCM-H26	Satellite position x vector at hour start	km	-360000 .. 360000	1	8
CCCM-H27	Satellite position y vector at hour start	km	-360000 .. 360000	1	8
CCCM-H28	Satellite position z vector at hour start	km	-360000 .. 360000	1	8
CCCM-H29	Satellite momentum x vector at hour start	km	-360000 .. 360000	1	8
CCCM-H30	Satellite momentum y vector at hour start	km	-360000 .. 360000	1	8
CCCM-H31	Satellite momentum z vector at hour start	km	-360000 .. 360000	1	8
CCCM-H32	InstSARB_ver	N/A	1 .. 32000	1	2
CCCM-H33	CRS production date and time	N/A	ASCII string	1	19
CCCM-H34	Spare character	N/A	ASCII string	1	3
CCCM-H35	CCCM production date and time	N/A	ASCII string	1	24
CCCM-H36	Layer center height profile (clouds and aerosol)	km	-0.5 .. 22.0	1	4
CCCM-H37	Level heights profile (clouds and aerosol)	km	-0.5 .. 22.0	1	4
CCCM-H38	Irradiance layer center height profile	km	-0.5 .. 65.0	1	4
CCCM-H39	Irradiance level height profile	km	-0.5 .. 65.0	1	4
CCCM-H40	CALIPSO cloud layer center height profile	km	-0.5 .. 22.0	1	4
CCCM-H41	CALIPSO cloud level height profile	km	-0.5 .. 22.0	1	4
CCCM-H42	Shortwave spectral wave number bounds	cm ⁻¹	1 .. 32000	1	2
CCCM-H43	Longwave spectral wave number bounds	cm ⁻¹	1 .. 32000	1	2
CCCM-H44	CALIPSO filename and version used 1	N/A	ASCII string	1	128
CCCM-H45	CALIPSO filename and version used 2	N/A	ASCII string	1	128
CCCM-H46	CALIPSO filename and version used 3	N/A	ASCII string	1	128
CCCM-H47	CloudSat filename and version used 1	N/A	ASCII string	1	128
CCCM-H48	CloudSat filename and version used 3	N/A	ASCII string	1	128
CCCM-H49	CloudSat filename and version used 2	N/A	ASCII string	1	128

Variables produced by the similar algorithms used to produce CERES SSF

Table 1.0-2 as well as other tables which item number start with “SSF” contains variables produced by the similar algorithm used to produce the CERES SSF product.

Table 1.0-2. Time and Position

Item	SDS Name (Variable name)	Units	Range	Dimensions	Data type	Maximum daily size (Mb)
SSF-1 (1)	Time of observation	day	2440000 .. 2480000	n	8-bytes real	0.2
SSF-2 (2)	Radius of satellite from center of Earth at observation	km	6000 .. 8000	n	8-bytes real	0.2
SSF-3 (3)	X component of satellite inertial velocity	km sec ⁻¹	-10 .. 10	n	8-bytes real	0.2
SSF-4 (4)	Y component of satellite inertial velocity	km sec ⁻¹	-10 .. 10	n	8-bytes real	0.2
SSF-5 (5)	Z component of satellite inertial velocity	km sec ⁻¹	-10 .. 10	n	8-bytes real	0.2
SSF-6 (6)	Colatitude of subsatellite point at surface at observation	deg	0 .. 180	n	4-bytes real	0.1
SSF-7 (7)	Longitude of subsatellite point at surface at observation	deg	0 .. 360	n	4-bytes real	0.1
SSF-8 (8)	Colatitude of subsolar point at surface at observation	deg	0 .. 180	n	4-bytes real	0.1
SSF-9 (9)	Longitude of subsolar point at surface at observation	deg	0 .. 360	n	4-bytes real	0.1
SSF-10 (10)	Colatitude of CERES FOV at surface	deg	0 .. 180	n	4-bytes real	0.1
SSF-11 (11)	Longitude of CERES FOV at surface	deg	0 .. 360	n	4-bytes real	0.1
SSF-12 (12)	Scan sample number	N/A	1 .. 660	n	2-bytes int	0.05
SSF-13 (13)	Packet number	N/A	0 .. 13100	n	2-bytes int	0.05
SSF-14 (14)	Cone angle of CERES FOV at satellite	deg	0 .. 90	n	4-bytes real	0.1
SSF-15 (15)	Clock angle of CERES FOV at satellite wrt inertial velocity	deg	0 .. 360	n	4-bytes real	0.1
SSF-16 (16)	Rate of change of cone angle	deg sec ⁻¹	-300 .. 300	n	4-bytes real	0.1
SSF-17 (17)	Rate of change of clock angle	deg sec ⁻¹	-20 .. 20	n	4-bytes real	0.1

SSF-18 (18)	Along-track angle of CERES FOV at surface	deg	-30 .. 330	n	4-bytes real	0.1
SSF-19 (19)	Cross-track angle of CERES FOV at surface	deg	-90 .. 90	n	4-bytes real	0.1

Table 1.0-3. Viewing Angles

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Daily Size (MB)
SSF-20 (20)	CERES viewing zenith at surface	deg	0 .. 90	n	4-bytes real	0.1
SSF-21 (21)	CERES solar zenith at surface	deg	0 .. 180	n	4-bytes real	0.1
SSF-22 (22)	CERES relative azimuth at surface	deg	0 .. 360	n	4-bytes real	0.1
SSF-23 (23)	CERES viewing azimuth at surface wrt North	deg	0 .. 360	n	4-bytes real	0.1

CCCM Scientific Data Sets

Symbols used for express dimensions in the following tables.

n (number of near nadir footprints per day) = 24 hr x 3600 sec/hr / 3.3 sec/scan ~ 26182

m (maximum number of cloud layer groups) = 16

p (maximum number of overlapping cloud layer in a cloud group) = 6

Note: IGBP surface type is from CERES.

Table 1.0-4. CALIPSO and MODIS Surface Map Along Ground track

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum DailySize (MB)
CCCM-1 (292)	Mean altitude of surface above sea level	m	-1000... 10000	n	4-bytes real	0.1
CCCM-2 (293)	Stdev of altitude of surface above sea level	m	-1000... 10000	n	4-bytes real	0.1
CCCM-3 (294)	Surface spectral albedo	N/A	0...100	n x 7	4-bytes real	0.7

CCCM-4 (295)	Mean CloudSat surface reflectivity			n	4-bytes real	0.1
CCCM-5 (296)	Stdev CloudSat surface reflectivity			n	4-bytes real	0.1

Variables in the following Table 1.0-5 are extracted from CALIPSO (Level 2 vertical feature mask data product) and Cloudst (2B-CLDCLASS) products and rearranged or averaged over a CERES footprint.

CCCM-18, -19: If an aerosol layer overlap with clouds, the thickest aerosol layer overlapping with each cloud group is kept.

CCCM-23, -24: Up to sixteen (m =16) aerosol layers over clear-sky (i.e. the cloud less portion in a CERES footprint according to CALIPSO and CloudSat) are kept.

Thick smoke (aerosols) sometimes completely attenuates the CALIPSO signal. The mean attenuation level for this complete attenuation case by smoke is kept separately from complete attenuation by clouds. When attenuation by aerosol occurs, it is assumed that this CALIPSO profile is clear (cloud free) unless CloudSat detects clouds below the complete attenuation level. Profiles with complete attenuation by smoke and no CloudSat clouds below the attenuation level are, therefore, included in clear (cloud free) area percent coverage.

Table 1.0-5. Cloud and aerosol mask (CALIPSO and CloudSat)

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Daily Size (MB)
CCCM-6 (297)	Total number of CloudSat profiles	N/A	0.. 70	n	2-bytes int	0.05
CCCM-7 (298)	Total number of CloudSat clear profiles	N/A	0 .. 70	n	2-bytes int	0.05
CCCM-8 (299)	Total number of good CloudSat profiles	N/A	0 .. 70	n	2-bytes int	0.05
CCCM-9 (300)	Total number of CALIPSO profiles	N/A	0 .. 210	n	2-bytes int	0.05
CCCM-10 (301)	Total number of CALIPSO clear profiles	N/A	0 .. 210	n	2-bytes int	0.05
CCCM-11 (302)	Total number of good CALIPSO profiles	N/A	0 .. 210	n	2-bytes int	0.05
CCCM-12 (303)	Cloud group area percent coverage	%	0 ...100	n x m	4-bytes real	1.6
CCCM-13 (304)	Cloud layer top level height	km	-0.5 .. 30	n x m x p	4-bytes real	9.6

CCCM-14 (305)	Cloud top source flag	N/A	11 .. 24	n x m x p	1-bytes int	2.4
CCCM-15 (306)	Cloud layer base level height	km	-0.5 .. 30	n x m x p	4-bytes real	9.6
CCCM-16 (307)	Cloud base source flag	N/A	11 .. 24	n x m x p	1-bytes int	2.4
CCCM-17 (308)	Precipitation flag CloudSat	N/A	0 ...10	n x m	1-bytes int	0.4
CCCM-18 (309)	CALIPSO aerosol layer (overlap with cloud) top level height	km	-0.5 .. 20.2	n x m	4-bytes real	1.6
CCCM-19 (310)	CALIPSO aerosol layer (overlap with clouds) base level height	km	-0.5 .. 20.2	n x m	4-bytes real	1.6
CCCM-20 (311)	Mean CALIPSO signal attenuation top level height (cloudy profile)	km	-0.5 .. 20.2	n x m	4-bytes real	1.6
CCCM-21 (312)	Cloud-free area percent coverage (CALIPSO-CloudSat)	%	0 ...100	n	4-bytes real	0.1
CCCM-22 (313)	CALIPSO aerosol area percent coverage without clouds	%	0 ...100	n	4-bytes real	0.1
CCCM-23 (314)	CALIPSO aerosol layer (over clear area) top level height	km	-0.5 .. 20.2	n x m	4-bytes real	1.6
CCCM-24 (315)	CALIPSO aerosol layer (over clear area) base layer height	km	-0.5 .. 20.2	n x m	4-bytes real	1.6
CCCM-25 (316)	Mean CALIPSO signal attenuation level height (aerosol area)	km	-0.5 .. 20.2	n	4-bytes real	0.1
CCCM-26 (317)	CALIPSO signal attenuation area percent coverage	%	0 ..100	n	4-bytes real	0.1

Table 1.0-6. CERES-derived TOA irradiances

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Daily Size (MB)
SSF-38 (38)	CERES SW TOA flux - upwards	W m ⁻²	0 .. 1400	n x 2	4-bytes real	0.2
SSF-38a (39)	CERES SW TOA flux - downwards	W m ⁻²	0 .. 1400	n x 2	4-bytes real	0.2
SSF-39 (40)	CERES LW TOA flux - upwards	W m ⁻²	0 .. 1400	n x 2	4-bytes real	0.2
SSF-40 (41)	CERES WN TOA flux - upwards	W m ⁻²	0 .. 1400	n x 2	4-bytes real	0.2

Variables in the following Table 1.0-7 are derived from MODIS radiances by CERES cloud algorithms.

Note:

Clear-area percentage coverage MODIS (CCCM-27) is the MODIS-derived clear-area over the clear area detected by both CALIPSO and MODIS.

Cloud percentage coverage MODIS (CCCM-28) is the MODIS-derived cloud cover for each cloud group (CCCM-13, and 15).

Second dimensional index

1. Scene I.D. from standard cloud algorithms
2. Scene I.D. from enhanced cloud algorithms

Third dimension is cloud group ($m = 16$).

Table 1.0-7. MODIS Properties over CALIPSO and CloudSat cloud and clear groups

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Daily Size (MB)
CCCM-27 (318)	Clear area percent coverage MODIS	%	0 ...100	n x 2	4-bytes real	0.2
CCCM-28 (319)	Cloud percent coverage over group from MODIS	%	0 ...100	n x 2 x m	4-bytes real	3.2
CCCM-29 (320)	Mean group visible optical depth from MODIS radiance	N/A	0 .. 400	n x 2 x m	4-bytes real	3.2
CCCM-30 (321)	Mean group logarithm of visible optical depth from MODIS rad	N/A	-6 .. 6	n x 2 x m	4-bytes real	3.2
CCCM-31 (232)	Mean group cloud top height from MODIS radiance	km	0 .. 20	n x 2 x m	4-bytes real	3.2
CCCM-32 (323)	Mean group water particle radius from MODIS radiance (3.7)	μm	0 .. 40	n x 2 x m	4-bytes real	3.2
CCCM-33 (324)	Mean group ice particle effective diameter from MODIS rad (3.7)	μm	0 .. 300	n x 2 x m	4-bytes real	3.2
CCCM-34 (325)	Mean group cloud particle phase from MODIS radiance (3.7)	N/A	1 .. 2	n x 2 x m	4-bytes real	3.2
CCCM-35 (326)	Mean group water particle radius from MODIS radiance (2.1)	μm	0 .. 40	n x 2 x m	4-bytes real	3.2
CCCM-36 (327)	Mean group ice particle effective diameter from MODIS rad (2.1)	μm	0 .. 300	n x 2 x m	4-bytes real	3.2

Variables in the following Table 1.0-8 are from Lidar 5 km aerosol layer product
Backscatter and extinction coefficient are averaged over areas where aerosols are present

Table 1.0-8. CALIPSO aerosol layer mean

Item	SDS Name (Variable Name)	Units	Range	Dimensions	Data Type	Maximum Daily Size (MB)
CCCM-37 (328)	CALIPSO aerosol layer percent coverage	N/A	0 ... 100	n x 16	2-bytes int	0.8
CCCM-38 (329)	CALIPSO aerosol layer top level height	km	-0.5 ... 30.1	n x 16	4-bytes real	1.6
CCCM-39 (330)	CALIPSO aerosol layer base level height	km	-0.5 ... 30.1	n x 16	4-bytes real	1.6
CCCM-40 (331)	CALIPSO aerosol layer opacity flag	N/A	0 ... 1	n x 16	1-bytes int	0.4
CCCM-41 (332)	CALIPSO layer aerosol horizontal averaging distance	km	5 ... 80	n x 16	1-bytes int	0.4
CCCM-42 (333)	CALIPSO aerosol feature classification flags	N/A	0 ... 127 (98298)	n x 16	1-bytes int	0.4
CCCM-43 (334)	Mean CALIPSO aerosol feature optical depth at 532 nm	N/A	0 ... 5.0	n x 16	4-bytes real	1.6
CCCM-44 (335)	Mean CALIPSO feature optical depth uncertainty at 532 nm	N/A	0 ... TBD	n x 16	4-bytes real	1.6
CCCM-45 (336)	Mean CALIPSO feature optical depth at 1064 nm	N/A	0 ... 5.0	n x 16	4-bytes real	1.6
CCCM-46 (337)	Mean CALIPSO feature optical depth uncertainty at 1064 nm	N/A	0 ... TBD	n x 16	4-bytes real	1.6
CCCM-47 (338)	Mean CALIPSO relative humidity in aerosol layer	%	0 ... 100	n x 16	4-bytes real	1.6
CCCM-48 (339)	Mean CALIPSO aerosol layer CAD score	N/A	-100 ... 100	n x 16	2-bytes int	0.8
CCCM-49 (340)	Mean CALIPSO aerosol optical thickness at 532 nm	N/A	-0.1 ... 5.0	n	4-bytes real	0.1
CCCM-50 (341)	Stdev CALIPSO aerosol optical thickness at 532 nm	N/A	0 ... 5.0	n	4-bytes real	0.1
CCCM-50a (342)	Mean CALIPSO aerosol optical thickness uncertainty at 532 nm	N/A	-0.1 ... 5.0	n	4-bytes real	0.1
CCCM-50b (343)	Stdev CALIPSO aerosol optical thickness uncertainty at 532 nm	N/A	0 ... 5.0	n	4-bytes real	0.1
CCCM-50c (344)	Mean CALIPSO aerosol optical thickness at 1064 nm	N/A	-0.1 ... 5.0	n	4-bytes real	0.1

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Daily Size (MB)
CCCM-50d (345)	Stdev CALIPSO aerosol optical thickness at 1064 nm	N/A	0 ... 5.0	n	4-bytes real	0.1
CCCM-50e (346)	Mean CALIPSO aerosol optical thickness uncertainty at 1064 nm	N/A	-0.1 ... 5.0	n	4-bytes real	0.1
CCCM-50f (347)	Stdev CALIPSO aerosol optical thickness uncertainty at 1064 nm	N/A	0 ... 5.0	n	4-bytes real	0.1

Variables in the following Table 1.0-9 are from lidar level 2 cloud 5 km layer product, level 2 5 km cloud profile data product, and CloudSat 2B-CLDCLASS and 2B-CWC-RO products. CALIPSO data are stored with 345 vertical resolutions. The height information is given by CCCM-H4. Other variables are stored with 113 vertical resolution. The height information is given by CCCM-121, 122, 125, and 126.

The second dimension of CCCM-73 is from 2B-CLDCLASS. 1:High clouds, 2:As, 3:Ac, 4:St, 5:Sc, 6:Cu, 7:Ns, 8: Deep convective clouds.

Table 1.0-9. Cloud layer mean

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Daily Size (MB)
CCCM-51 (348)	CALIPSO layer cloud type profile	N/A	0...7	n x 113	2-bytes int	5.7
CCCM-52 (349)	Cloud fraction profile	N/A	0...100	n x 113	4-bytes real	11.3
CCCM-53 (350)	Mean CALIPSO cloud layer CAD score	N/A	-100 ... 102	n x 345	2-bytes int	17.3
CCCM-54 (351)	Mean CALIPSO cloud layer extinction coefficient at 532 nm	km ⁻¹	0...100	n x 345	4-bytes real	34.5
CCCM-55 (352)	Mean CALIPSO constrained cloud layer extinction coeff at 532 nm	km ⁻¹	0...100	n x 345	4-bytes real	34.5
CCCM-56 (353)	Mean logarithm of CALIPSO extinction coefficient at 532 nm	N/A	-6.0 ... 6.0	n x 345	4-bytes real	34.5
CCCM-57 (354)	CALIPSO extinction coefficient uncertainty at 532 nm	km ⁻¹	0 ... TBD	n x 345	4-bytes real	34.5
CCCM-58 (355)	Mean CALIPSO ice water content	gm ⁻³	0 ... TBD	n x 345	4-bytes real	34.5
CCCM-59 (356)	Stdev of CALIPSO ice water content	gm ⁻³	0 ... TBD	n x 345	4-bytes real	34.5

Table 1.0-9. Cloud layer mean

Item	SDS Name (Variable Name)	Units	Range	Dimensions	Data Type	Maximum Daily Size (MB)
CCCM-60 (357)	CALIPSO ice water content uncertainty	gm ⁻³	0 ... TBD	n x 345	4-bytes real	34.5
CCCM-60a (358)	Mean CALIPSO cloud optical depth at 532 nm	N/A	0 ... 5.0	n	4-bytes real	0.1
CCCM-60b (359)	Stdev CALIPSO cloud optical depth at 532 nm	N/A	0 ... 5.0	n	4-bytes real	0.1
CCCM-60c (360)	Mean CALIPSO cloud optical depth uncertainty at 532 nm	N/A	0 ... 5.0	n	4-bytes real	0.1
CCCM-60d (361)	Stdev CALIPSO cloud optical depth uncertainty at 532 nm	N/A	0 ... 5.0	n	4-bytes real	0.1
CCCM-61 (362)	Mean CloudSat radar only liquid effective radius	μm	0 ... 1000	n x 113	4-bytes real	11.3
CCCM-62 (363)	Stdev of CloudSat radar only liquid effective radius	μm	0 ... 1000	n x 113	4-bytes real	11.3
CCCM-63 (364)	CloudSat radar only liquid effective radius uncertainty	N/A	0 ... 250	n x 113	4-bytes real	11.3
CCCM-64 (365)	Mean CloudSat radar only ice effective radius	μm	0 ... 3000	n x 113	4-bytes real	11.3
CCCM-65 (366)	Stdev of CloudSat radar only ice effective radius	μm	0 ... 3000	n x 113	4-bytes real	11.3
CCCM-66 (367)	CloudSat radar only ice effective radius uncertainty	N/A	0 ... 250	n x 113	4-bytes real	11.3
CCCM-67 (368)	Mean CloudSat radar only liquid water content	gm ⁻³	0 ... 15.0	n x 113	4-bytes real	11.3
CCCM-68 (369)	Stdev of CloudSat radar only liquid water content	gm ⁻³	0 ... 15.0	n x 113	4-bytes real	11.3
CCCM-69 (370)	CloudSat radar only liquid water content uncertainty	N/A	0 ... 250	n x 113	4-bytes real	11.3
CCCM-70 (371)	Mean CloudSat radar only ice water content	gm ⁻³	0 ... 10.0	n x 113	4-bytes real	11.3
CCCM-71 (372)	Stdev of CloudSat radar only ice water content	gm ⁻³	0 ... 10.0	n x 113	4-bytes real	11.3
CCCM-72 (373)	CloudSat radar only ice water content uncertainty	N/A	0 ... 250	n x 113	4-bytes real	11.3
CCCM-73 (374)	CloudSat cloud type histogram	100 * %	0 ... 10000	n x 8	2-bytes int	0.4

Irradiance profile (Table 1.0-10 and 1.0-11).

All fluxes are given at the edge of each layers (138 levels, 1 = TOA, 138 = sea level -480 m, CCCM-124). In addition to top-of-atmosphere (65 km) and surface, the up and downward irradiances are computed at the edge of layers (levels) by the CERES radiative transfer code (Flux model for CERES with K-distribution and correlated-K for Radiation: FLCKKR). Depths of the layers are 120 m below the altitude of 3 km, 240 m from 3 km to 21 km, 480 m from 21 km to 33 km, 3000 m from 33 km to 45 km, 5000m from 45 km to 65 km. The vertical resolution of irradiance profile is given by CCCM-122 and 123.

The second dimensional index of irradiance profiles is

- 1 = cloud+aerosol (all-sky)
- 2 = cloud only (all-sky with no aerosols)
- 3 = clear-sky (with aerosol)
- 4 = clear-sky (without aerosol, pristine).

The third dimensional index is the vertical level.

Wavelength information of TOA and surface spectral irradiances is given by CCCM-127 (shortwave) and CCCM-128 (longwave).

Note for Window flux: Modeled window irradiances have different spectral band than the CERES window channel. The equivalent window irradiance is kept only for TOA (CCCM-93). The CERES window flux is computed with CALIPSO-CloudSat clouds and clouds from MODIS enhanced algorithm.

Note for irradiance model flag: The flag indicates where the optical property of clouds and aerosols come from.

Table 1.0-10. Vertical model input profile

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Daily Size (MB)
CCCM-74 (375)	Modeled aerosol type	N/A	0 ... 100	n x 7	2-bytes int	0.35
CCCM-75 (376)	Aerosol source flag	N/A	0 10	n	2-bytes int	0.05
CCCM-75a (377)	Surface albedo source	N/A	0 10	n	2-bytes int	0.05
CCCM-76 (378)	Pressure profile	hPa	0 ... 1100	n x 138	4-bytes real	13.8
CCCM-77 (379)	Temperature profile	K	100 ... 400	n x 138	4-bytes real	13.8

Table 1.0-10. Vertical model input profile

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Daily Size (MB)
CCCM-78 (380)	Water vapor mixing ratio profile	g/g	0.00001 0.03	n x 138	4-bytes real	13.8
CCCM-79 (381)	Ozone mixing ratio profile	g/g	0.0 ... 0.00005	n x 138	4-bytes real	6.6
CCCM-80 (382)	Surface geopotential height	m	-100 ... 10000	n	2-bytes int	0.05
CCCM-81 (383)	Lifting condensation level	hPa	0...1100	n	2-bytes int	0.05
CCCM-82 (384)	Aerosol extinction coefficient profile used	km ⁻¹	0 ... 10.0	n x 137	4-bytes real	13.7
CCCM-82a (385)	Cloud area untuned	N/A	0 ... 100.0	n	4-bytes real	0.1
CCCM-82b (386)	Cloud area enhanced	N/A	0 ... 100.0	n	4-bytes real	0.1
CCCM-82c (387)	Cloud optical depth weight untuned	N/A	0 ... 128.0	n	4-bytes real	0.1
CCCM-82d (388)	Cloud optical depth weight enhanced	N/A	0 ... 128.0	n	4-bytes real	0.1
CCCM-83 (389)	Aerosol single scattering albedo profile used	N/A	0 ... 1.0	n x 137	4-bytes real	13.7
CCCM-84 (390)	Cloud extinction coefficient profile used	km ⁻¹	0...128	n x 137	4-bytes real	13.7
CCCM-85 (391)	Liquid water content profile used	gm ⁻³	0 ... 15.0	n x 137	4-bytes real	13.7
CCCM-86 (392)	Ice water content profile used	gm ⁻³	0 ... 10.0	n x 137	4-bytes real	13.7

Table 1.0-11. Vertical Irradiance profile

Item	SDS Name (Variable Name)	Units	Range	Dimensions	Data Type	Maximum Daily Size (MB)
CCCM-87 (393)	SW downward flux profile enhanced MODIS (CALIPSO CloudSat)	Wm^{-2}	0 ... 1500	n x 4 x 138	4-bytes real	55.2
CCCM-88 (394)	SW upward flux profile enhanced MODIS (CALIPSO CloudSat)	Wm^{-2}	0 ... 1500	n x 4 x 138	4-bytes real	55.2
CCCM-89 (395)	LW downward flux profile enhanced MODIS (CALIPSO CloudSat)	Wm^{-2}	0 ... 1500	n x 4 x 138	4-bytes real	55.2
CCCM-90 (396)	LW upward flux profile enhanced MODIS (CALIPSO CloudSat)	Wm^{-2}	0 ... 1500	n x 4 x 138	4-bytes real	55.2
CCCM-91 (397)	WN downward flux profile enhanced MODIS (CALIPSO CloudSat)	Wm^{-2}	0 ... 1500	n x 4 x 138	4-bytes real	55.2
CCCM-92 (398)	WN upward flux profile enhanced MODIS (CALIPSO CloudSat)	Wm^{-2}	0 ... 1500	n x 4 x 138	4-bytes real	55.2
CCCM-93 (399)	SW downward flux TOA standard MODIS (CALIPSO CloudSat)	Wm^{-2}	0 ... 1500	n x 4	4-bytes real	0.4
CCCM-94 (400)	SW upward flux TOA standard MODIS (CALIPSO CloudSat)	Wm^{-2}	0 ... 1500	n x 4	4-bytes real	0.4
CCCM-95 (401)	SW downward flux surface standard MODIS (CALIPSO CloudSat)	Wm^{-2}	0 ... 1500	n x 4	4-bytes real	0.4
CCCM-96 (402)	SW upward flux surface standard MODIS (CALIPSO CloudSat)	Wm^{-2}	0 ... 1500	n x 4	4-bytes real	0.4
CCCM-97 (403)	LW downward flux surface standard MODIS (CALIPSO CloudSat)	Wm^{-2}	0 ... 1500	n x 4	4-bytes real	0.4
CCCM-98 (404)	LW upward flux TOA standard MODIS (CALIPSO CloudSat)	Wm^{-2}	0 ... 1500	n x 4	4-bytes real	0.4
CCCM-99 (405)	LW upward flux surface standard MODIS (CALIPSO CloudSat)	Wm^{-2}	0 ... 1500	n x 4	4-bytes real	0.4
CCCM-100 (406)	WN downward flux surface standard MODIS (CALIPSO CloudSat)	Wm^{-2}	0 ... 1500	n x 4	4-bytes real	0.4
CCCM-101 (407)	WN upward flux TOA standard MODIS (CALIPSO CloudSat)	Wm^{-2}	0 ... 1500	n x 4	4-bytes real	0.4
CCCM-102 (408)	WN upward flux surface standard MODIS (CALIPSO CloudSat)	Wm^{-2}	0 ... 1500	n x 4	4-bytes real	0.4
CCCM-103 (409)	SW all-sky up TOA spectral flux enh MODIS (CALIPSO CloudSat)	Wm^{-2}	0 ... 1500	n x 14	4-bytes real	1.4
CCCM-104 (410)	SW all-sky down TOA spectral flux enh MODIS (CALIPSO CloudSat)	Wm^{-2}	0 ... 1500	n x 14	4-bytes real	1.4

Table 1.0-11. Vertical Irradiance profile

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Daily Size (MB)
CCCM-105 (411)	SW all-sky up surface spectral flux enh MODIS (CALIPSO CloudSat)	Wm^{-2}	0 ... 1500	n x 14	4-bytes real	1.4
CCCM-106 (412)	SW all-sky down surface spectral flux enh MODIS (CALIPSO CldSat)	Wm^{-2}	0 ... 1500	n x 14	4-bytes real	1.4
CCCM-107 (413)	LW all-sky up TOA spectral flux enh MODIS (CALIPSO CloudSat)	Wm^{-2} sr^{-1}	0 ... 1500	n x 12	4-bytes real	1.2
CCCM-108 (414)	LW all-sky up surface spectral flux enh MODIS (CALIPSO CldSat)	Wm^{-2}	0 ... 1500	n x 12	4-bytes real	1.2
CCCM-109 (415)	LW all-sky down surface spectral flux enh MODIS (CALIPSO CldSat)	K	0 ... 1500	n x 12	4-bytes real	1.2
CCCM-110 (416)	LW TOA modeled unfiltered radiance enhanced (CALIPSO-CloudSat)	Wm^{-2} sr^{-1}	0 ... 200	n	4-bytes real	0.1
CCCM-111 (417)	WN TOA modeled unfiltered radiance enhanced (CALIPSO-CloudSat)	Wm^{-2} sr^{-1}	0 ... 60	n	4-bytes real	0.1
CCCM-112 (418)	WN TOA modeled filtered radiance enhanced (CALIPSO-CloudSat)	Wm^{-2} sr^{-1}	0 ... 50	n	4-bytes real	0.1
CCCM-113 (419)	WN TOA upward flux enhanced (CALIPSO CloudSat,)	Wm^{-2}	0 ... 1500	n	4-bytes real	0.1
CCCM-114 (420)	LW TOA modeled unfiltered radiance standard (CALIPSO-CloudSat)	Wm^{-2} sr^{-1}	0 ... 200	n	4-bytes real	0.1
CCCM-115 (421)	WN TOA modeled unfiltered radiance standard (CALIPSO-CloudSat)	Wm^{-2} sr^{-1}	0 ... 60	n	4-bytes real	0.1
CCCM-116 (422)	WN TOA modeled filtered radiance standard (CALIPSO-CloudSat)	Wm^{-2} sr^{-1}	0 ... 50	n	4-bytes real	0.1
CCCM-117 (423)	WN TOA upward flux standard (CALIPSO CloudSat,)	Wm^{-2}	0 ... 1500	n	4-bytes real	0.1
CCCM-118 (424)	Irradiance modeling source flag	N/A	0 ... 6000	n	2-bytes int	0.05
CCCM-119 (425)	Flux confidence flag	N/A	0 ... 32767	n x 2	2-bytes int	0.1

Table 1.0-12. Coordinate variables

Item	SDS Name (Variable Name)	Units	Range	Dimensions	Data Type	Maximum Hourly Size (MB)
CCCM-120 (426)	Irradiance surface level	N/A	1 ... 138	n	2-bytes int	0.05
CCCM-121 (427)	Layer center height profile (clouds and aerosols)	km	-0.42...29.75	113	4-bytes real	< 0.01
CCCM-122 (428)	Level height profile (clouds and aerosols)	km	-0.48...30	114	4-bytes real	< 0.01
CCCM-123 (429)	Irradiance layer center height profile	km	-0.42...62.5	137	4-bytes real	< 0.01
CCCM-124 (430)	Irradiance level height profile	km	-0.48...65	138	4-bytes real	< 0.01
CCCM-125 (431)	CALIPSO cloud layer center height profile	km	-0.47....20.17	345	4-bytes real	< 0.01
CCCM-126 (432)	CALIPSO cloud level height profile	km	-0.50....20.20	346	4-bytes real	< 0.01
CCCM-127 (433)	Shortwave spectral wave number bounds	cm ⁻¹	1 .. 32000	15	2-bytes int	< 0.01
CCCM-128 (434)	Longwavelength spectral wave number bounds	cm ⁻¹	1 .. 32000	13	2-bytes int	< 0.01

SSF Parameters

When the second dimensional index is 2, it refers to cloud 1 and cloud 2, where cloud 1 is lower altitude than cloud 2.

Second (or third) dimensional index

1. Cloud and aerosol properties derived from MODIS radiances by the standard CERES cloud algorithms and averaged over the entire CERES footprint
2. Cloud and aerosol properties derived from MODIS radiances by the standard CERES cloud algorithms and averaged only along the ground track
3. Cloud and aerosol properties derived from MODIS radiances by the enhanced CERES cloud algorithms and averaged only along the ground track
4. Cloud and aerosol properties derived from MODIS radiances by the enhanced CERES cloud algorithms and averaged over the entire CERES footprint

Table 1.0-13. Properties derived from MODIS from clear-sky area

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-66 (77)	Clear area percent coverage at subpixel resolution	N/A	0 .. 100	n x 4	4-bytes real	0.4
SSF-67 (78)	Cloud-mask clear-strong percent coverage	N/A	0 .. 100	n x 4	2-bytes int	0.2
SSF-68 (79)	Cloud-mask clear-weak percent coverage	N/A	0 .. 100	n x 4	2-bytes int	0.2
SSF-69 (80)	Cloud-mask snow/ice percent coverage	N/A	0 .. 100	n x 4	2-bytes int	0.2
SSF-70 (81)	Cloud-mask aerosol B percent coverage	N/A	0 .. 100	n x 4	2-bytes int	0.2
SSF-71 (82)	Flag - Type of aerosol B	N/A	0 .. 9999	n x 4	2-bytes int	0.2
SSF-72 (83)	Cloud-mask percent coverage supplement	N/A	0 .. 32766	n x 4	2-bytes int	0.2
SSF-73 (84)	Total aerosol A optical depth - visible	N/A	-1 .. 5	n x 4	4-bytes real	0.4
SSF-74 (85)	Total aerosol A optical depth - near IR	N/A	-1 .. 5	n x 4	4-bytes real	0.4
SSF-75 (86)	Aerosol A supplement 1	N/A	-1000 .. 1000	n x 4	4-bytes real	0.4
SSF-76 (87)	Aerosol A supplement 2	N/A	-1000 .. 1000	n x 4	4-bytes real	0.4
SSF-77 (88)	Aerosol A supplement 3	N/A	-1000 .. 1000	n x 4	4-bytes real	0.4
SSF-78 (89)	Aerosol A supplement 4	N/A	-1000 .. 1000	n x 4	4-bytes real	0.4
SSF-79 (90)	Imager-based surface skin temperature	K	175 .. 375	n x 4	4-bytes real	0.4
SSF-79a (91)	Imager-based precipitable water	cm	0.001 .. 10	n x 4	4-bytes real	0.4
SSF-80 (92)	Vertical temperature change	K	-30 .. 90	n x 4	4-bytes real	0.4

Table 1.0-14. Properties derived from MODIS from cloudy-sky area

Item	SDS Name (Variable Name)	Units	Range	Dimensions	Data Type	Maximum Hourly Size (MB)
SSF-81 (93)	Clear/layer/overlap percent coverages	N/A	0 .. 100	n x 4 x 4	4-bytes real	1.6
SSF-82 (94)	Note for cloud layer	N/A	0 .. (2^{31-1})	n x 4 x 2	4-bytes int	0.8
SSF-83 (95)	Mean visible optical depth for cloud layer	N/A	0 .. 400	n x 4 x 2	4-bytes real	0.8
SSF-84 (96)	Stddev of visible optical depth for cloud layer	N/A	0 .. 300	n x 4 x 2	4-bytes real	0.8
SSF-85 (97)	Mean logarithm of visible optical depth for cloud layer	N/A	-6 .. 6	n x 4 x 2	4-bytes real	0.8
SSF-86 (98)	Stddev of logarithm of visible optical depth for cloud layer	N/A	0 .. 6	n x 4 x 2	4-bytes real	0.8
SSF-87 (99)	Mean cloud infrared emissivity for cloud layer	N/A	0 .. 2	n x 4 x 2	4-bytes real	0.8
SSF-88 (100)	Stddev of cloud infrared emissivity for cloud layer	N/A	0 .. 2	n x 4 x 2	4-bytes real	0.8
SSF-89 (101)	Mean liquid water path for cloud layer (3.7)	g m ⁻²	0 .. 10000	n x 4 x 2	4-bytes real	0.8
SSF-90 (102)	Stddev of liquid water path for cloud layer (3.7)	g m ⁻²	0 .. 8000	n x 4 x 2	4-bytes real	0.8
SSF-91 (103)	Mean ice water path for cloud layer (3.7)	g m ⁻²	0 .. 10000	n x 4 x 2	4-bytes real	0.8
SSF-92 (104)	Stddev of ice water path for cloud layer (3.7)	g m ⁻²	0 .. 8000	n x 4 x 2	4-bytes real	0.8
SSF-93 (105)	Mean cloud top pressure for cloud layer	hPa	0 .. 1100	n x 4 x 2	4-bytes real	0.8
SSF-94 (106)	Stddev of cloud top pressure for cloud layer	hPa	0 .. 600	n x 4 x 2	4-bytes real	0.8
SSF-94a (107)	Mean cloud top temperature for cloud layer	K	100 .. 350	n x 4 x 2	4-bytes real	0.8
SSF-94b (108)	Mean cloud top height for cloud layer	km	0 .. 20	n x 4 x 2	4-bytes real	0.8
SSF-95 (109)	Mean cloud effective pressure for cloud layer	hPa	0 .. 1100	n x 4 x 2	4-bytes real	0.8
SSF-96 (110)	Stddev of cloud effective pressure for cloud layer	hPa	0 .. 500	n x 4 x 2	4-bytes real	0.8

Table 1.0-14. Properties derived from MODIS from cloudy-sky area

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-97 (111)	Mean cloud effective temperature for cloud layer	K	100 .. 350	n x 4 x 2	4-bytes real	0.8
SSF-98 (112)	Stddev of cloud effective temperature for cloud layer	K	0 .. 150	n x 4 x 2	4-bytes real	0.8
SSF-99 (113)	Mean cloud effective height for cloud layer	km	0 .. 20	n x 4 x 2	4-bytes real	0.8
SSF-100 (114)	Stddev of cloud effective height for cloud layer	km	0 .. 12	n x 4 x 2	4-bytes real	0.8
SSF-101 (115)	Mean cloud base pressure for cloud layer	hPa	0 .. 1100	n x 4 x 2	4-bytes real	0.8
SSF-102 (116)	Stddev of cloud base pressure for cloud layer	hPa	0 .. 600	n x 4 x 2	4-bytes real	0.8
SSF-102a (117)	Mean cloud base temperature for cloud layer	K	100 .. 350	n x 4 x 2	4-bytes real	0.8
SSF-103 (118)	Mean water particle radius for cloud layer (3.7)	μm	0 .. 40	n x 4 x 2	4-bytes real	0.8
SSF-104 (119)	Stddev of water particle radius for cloud layer (3.7)	μm	0 .. 20	n x 4 x 2	4-bytes real	0.8
SSF-105 (120)	Mean ice particle effective diameter for cloud layer (3.7)	μm	0 .. 300	n x 4 x 2	4-bytes real	0.8
SSF-106 (121)	Stddev of ice particle effective diameter for cloud layer (3.7)	μm	0 .. 200	n x 4 x 2	4-bytes real	0.8
SSF-107 (122)	Mean cloud particle phase for cloud layer (3.7)	N/A	1 .. 2	n x 4 x 2	4-bytes real	0.8
SSF-110a (123)	Mean water particle radius for cloud layer (1.6)	μm	0 .. 40	n x 4 x 2	4-bytes real	0.8
SSF-110b (124)	Mean ice particle effective diameter for cloud layer (1.6)	μm	0 .. 300	n x 4 x 2	4-bytes real	0.8
SSF-110c (125)	Mean logarithm of visible optical depth for cloud layer (1.6)	N/A	-6 .. 6	n x 4 x 2	4-bytes real	0.8
SSF-110a (126)	Mean water particle radius for cloud layer (2.1)	μm	0 .. 40	n x 2 x 4	4-bytes real	0.8
SSF-110b (127)	Mean ice particle effective diameter for cloud layer (2.1)	μm	0 .. 300	n x 2 x 4	4-bytes real	0.8
SSF-110c (128)	Mean logarithm of visible optical depth for cloud layer (2.1)	N/A	-6 .. 6	n x 2 x 4	4-bytes real	0.8

Table 1.0-14. Properties derived from MODIS from cloudy-sky area

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-111 (129)	CO2 slicing percent coverages for cloud layer	N/A	0 .. 100	n x 4 x 2	4-bytes real	0.8
SSF-111a (130)	Mean infrared emissivity for cloud layer - CO2 slicing	N/A	0 .. 2	n x 4 x 2	4-bytes real	0.8
SSF-111b (131)	Mean effective pressure for cloud layer - CO2 slicing	hPa	0 .. 1100	n x 4 x 2	4-bytes real	0.8
SSF-111c (132)	Mean effective temperature for cloud layer - CO2 slicing	K	100 .. 350	n x 4 x 2	4-bytes real	0.8
SSF-112 (133)	Mean effective height for cloud layer - CO2 slicing	km	0 .. 20	n x 4 x 2	4-bytes real	0.8
SSF-113 (134)	Percentiles of visible optical depth for cloud layer	N/A	0 .. 400	n x 4 x 13 x 2	4-bytes real	10.4

The second dimensional index of variables in Table 1.0-15 is the same as the third index of variables in Table 1.0-13.

The third dimensional index of variables in Table 1.0-15 is,

1. single lower cloud layer from Edition 2 (Ed2) cloud algorithm that are not multi-layer including optically thick clouds,
2. single upper cloud layer from Ed2 cloud algorithm that are not multilayer including optically thick clouds,
3. multilayer cloud that were assigned to lower cloud layer when the Ed2 cloud algorithm is used,
4. multilayer cloud that were assigned to upper cloud layer when the Ed2 cloud algorithm is used.

Descriptions of how these 4 cloud classifications are made and other cloud properties associated with these cloud classes are included below because these are significantly different from Ed2.

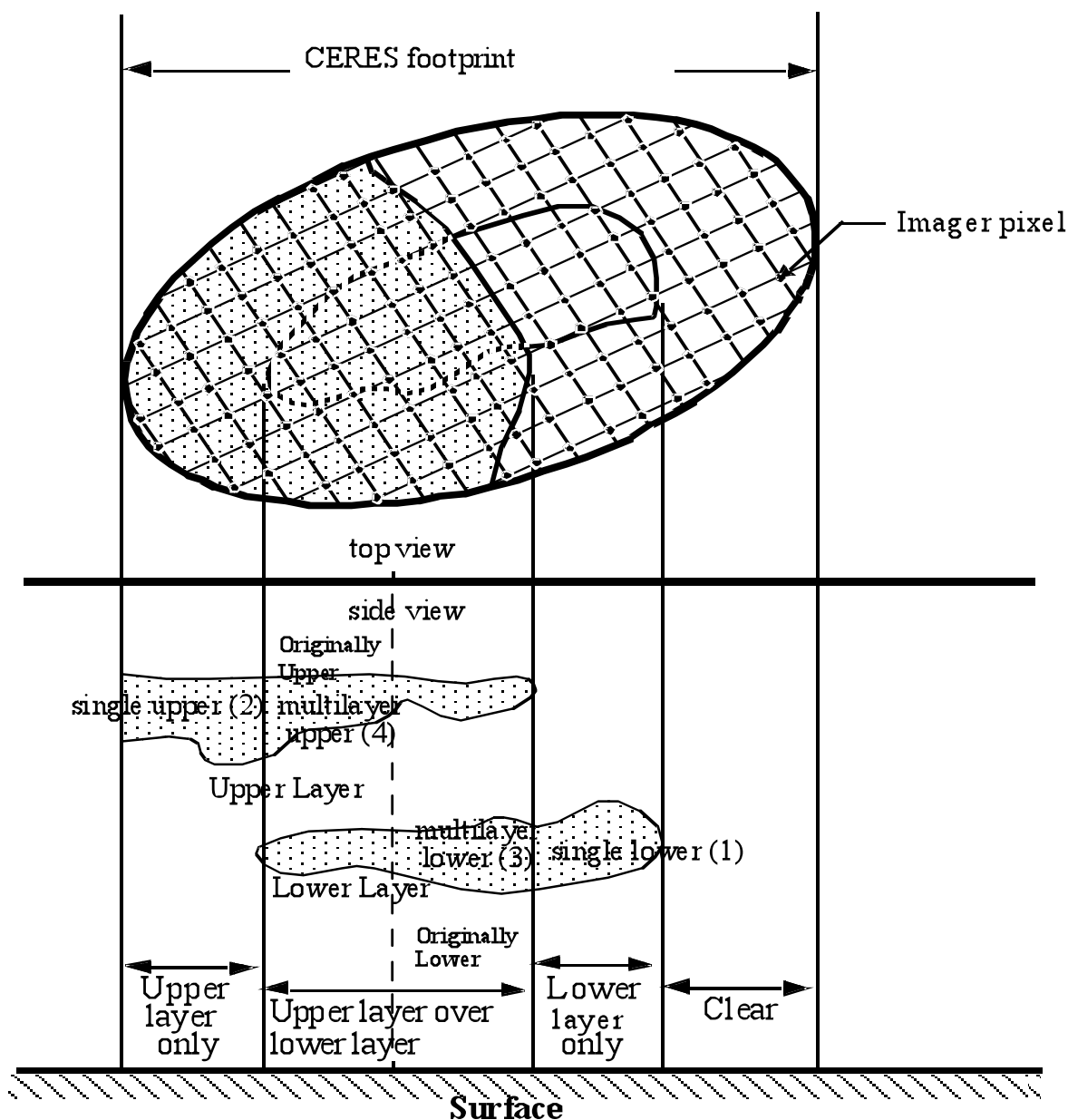


Figure 3. Illustration of the CERES single layer/multilayer cloud classification. (1) single lower layer, (2) single upper layer, (3) lower multi-layer, and (4) upper multi-layer in Ed4 SSF. Note that if the Ed2 cloud algorithm were used, the sum of (1) and (3) would be classified as a lower layer and the sum of (2) and (4) would be classified as an upper layer because cloud overlap is not treated in the Ed2 algorithm (i.e. (3) and (4) is zero). Clouds classified as (3) would belong to (1) if the Ed2 algorithm were applied. Similarly clouds classified as (4) would belong to (2)).

The cloud variables in Table 1.0-14 are obtained using Ed4 CERES cloud algorithm which is a revised version of the algorithm used in Ed2. The multi-layer cloud algorithm is also applied to MODIS pixels to derive the multi-layer cloud variables listed in Table 1.0-15. An ability to relate changes in clouds coverage and variable between the revised original cloud algorithm and

the multilayer algorithm was implemented. Pixels that are assigned to the lower cloud layer SSF-81 (i.e. the second percentage of the third dimension of the variable) would either not be identified as multilayer and remain a single lower layer (1) or be identified as a multilayer cloud with coverage reported in multilayer lower (3), i.e. $SSF-81(2) = SSF-114a(1) + SSF-114a(3)$. Note that the upper layer that extends into (3), was probably not detected by the cloud algorithm. The lower layer of the multilayer cloud (3) was detected by the cloud algorithm as a low cloud, but probably at a higher height than in the multilayer algorithm. Similarly, this process is repeated for the upper layer cloud in SSF-81 (i.e. the third percentage of the third dimension of the variable), if it exists in a CERES footprint. Where a upper layer pixel would either not be identified as multilayer and remain a single upper layer (2) or be identified as a multilayer cloud with coverage in multilayer upper (4), i.e. $SSF-81(3) = SSF-114a(2) + SSF-114a(4)$. To determine the total coverage of multilayer clouds, the coverage in (3) and (4) need to be summed. If the multilayer coverages for a given FOV are not set to CERES default, their sum is equal to 100 minus clear coverage (SSF-81, the first percentage of the third dimension) plus or minus a round off error.

There are several special cases that can occur. The first is if there is not an upper layer in SSF-81 (i.e. the third percentage of the third dimension of the variable is zero), Then multilayer coverage of SSF-114a(2) and SSF-114a(4) will also be zero. Additionally, if none of the pixels assigned to the lower layer cloud in SSF-81 were identified as multilayer, coverage of SSF-114a(3) will be zero. Likewise, if the upper layer cloud in SSF-81 is too thick to identify any lower clouds below it, SSF-114a(4) will be zero. Therefore, the multi-layer cloud coverage of SSF-114a(3) and SSF-114a(4) usually contains different values. In the extreme case above, either SSF-114a(3) or SSF-114a(4) is zero. Another possibility would be that all pixels associated with the lower cloud in SSF-81 would be identified as multilayer resulting in the coverage of SSF-114a(1) being 0. If this happens in the upper cloud, coverage of SSF-114a(2) will be zero. If no multilayer clouds are found, the coverage of SSF-114a(1) and SSF-114a(2) is the same as in SSF-81(2) and SSF-81(3) and SSF-114a(3) and SSF-114a(4) are zero.

There are cases where the cloud mask identifies clouds, but cloud properties cannot be assigned. If enough known cloud properties exists, the known properties are assume to be the same for the unknown pixels. The percent of pixels this occurs for is reported in "Cloud property extrapolation over cloudy area" (See SSF-63). However, if this percentage is too large, SSF-63, SSF-81 (2-4), and SSF-114a are all set to CERES default.

The cloud layer parameters shown in Table 1.0-15 (SSF-114b thru SSF-114k) is based on these multi-layer cloud classifications. The cloud properties reported in (1) are from the cloud algorithm using pixels associated with the lower layer that have not been reclassified. The properties reported in (2) are from the cloud algorithm using pixels associated with the upper layer that have not been reclassified. The cloud properties reported in (3) are for the lower multilayer determined by the multilayer algorithm from all pixel reclassified as multilayer (those included in (3) and (4)). The cloud properties reported in (4) are for the upper multilayer determined by the multilayer algorithm from all pixel reclassified as multilayer (those included in (3) and (4)). The percent coverage provided in SSF-114a are relative to the entire SSF footprint. To determine the percentage of cloud in each category, the denominator is the sum of the cloudy area (i.e. the area given by SSF-114a 1+2+3+4).

SSF-114b Mean visible optical depth for multilayer

PSF-weighted mean visible optical depth derived from imager radiances that fall within the CERES FOV, over single layer and multi-layer clouds. (N/A) [0 .. 400], i.e. (1) and (2) for this variable corresponds to the area of (1) and (2) respectively. (3) and (4) for this variables corresponds to the sum of area (3) and (4) for both discussed above. The optical thickness of (1) through (4) is averaged by weighting by the respective fractional coverage in addition to the PSF. If one of following three cases occurs, this value is set to the CERES default value. 1) there are no imager pixels with valid optical depth values, 2) the corresponding single layer area percent coverage is zero, or 3) both multilayer area percent coverage is 0, or CERES default. This variable is always set to the CERES default value when the solar zenith angle is greater than 90 degrees.

SSF-114e Mean cloud top pressure for multilayer

PSF-weighted mean top pressure derived from imager radiances that fall within the CERES FOV and over single multi-layer clouds. (hPa) [0 .. 1100]], i.e. sum of the area of (1), (2), (3), and (4) discussed above.

The averaged values are weighted by the imager pixel fraction of corresponding cloud area coverage to total cloud cover in addition to PSF. If there are no imager pixels with valid cloud top pressure values or if the corresponding single layer or both multilayer area percent coverage is set to 0 or CERES default, this variable is set to CERES default. If two cloud layers exist within a CERES footprint according to the Ed2 cloud algorithm, such as shown in Figure 2, 4 cloud top pressures corresponds to 4 cloud percent coverage in SSF-114a. However, if only one layer exists within a footprint, cloud top pressure is stored in the way shown in Figure 3.

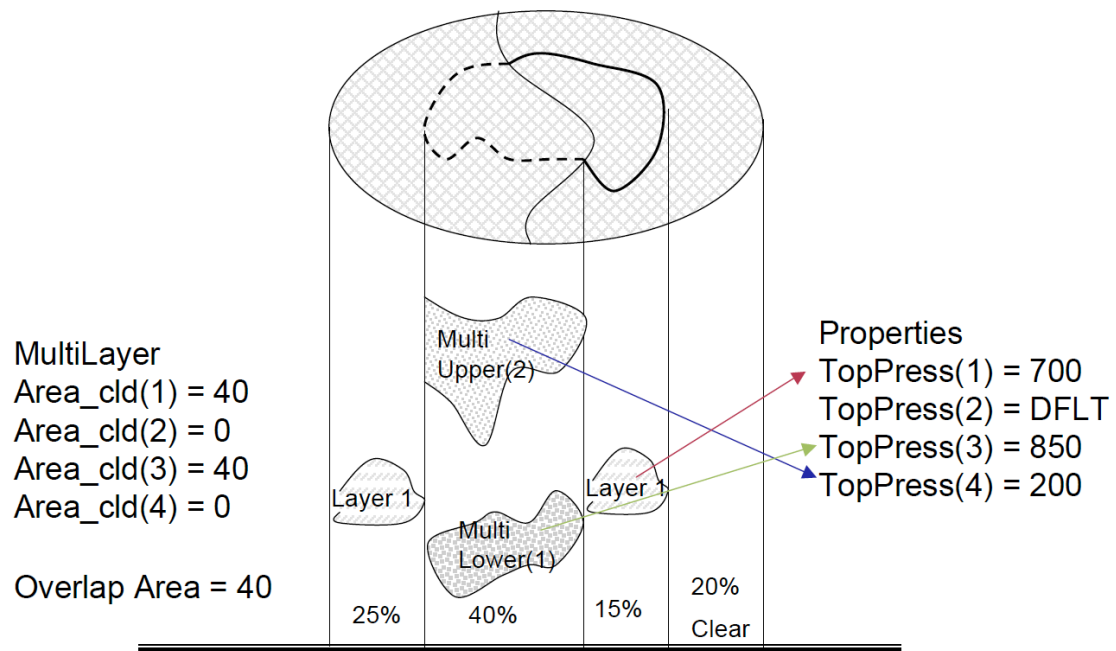


Figure 4: Place where the cloud top pressure stored in SSF-114e when the Ed2 cloud algorithm produces a 1 layer cloud but Ed4 algorithm detects multiple layers in the footprint.

The derived cloud phase, effective cloud temperature, and the cloud emissivity are used in a set of empirical formulae to compute the cloud top emissivity and physical cloud top height. This cloud-top emissivity is used to compute an estimate of cloud-top radiance using the clear-sky and observed radiances. Cloud-top radiance is converted to cloud-top brightness temperature. The temperature and height profiles from reanalysis are linearly interpolated, and the height value that corresponds to the cloud-top temperature is determined. The cloud top height of clouds with large emissivities (> 0.99) are assumed to be the same as the cloud effective height. The cloud-top pressure is obtained from the cloud height using the vertical pressure profile from reanalysis. Cloud top pressure is only calculated for daytime.

SSF-114f Mean cloud top temperature for multilayer

PSF-weighted mean cloud top temperature derived from imager radiances that fall within the CERES FOV and over single and multi-layer clouds. (K) [100 .. 350]], i.e. sum of the area of (1), (2), (3), and (4) discussed above.

The bin-averaged values are weighted by the imager pixel fraction of corresponding layer imager pixels to total imager pixels and PSF. If there are no imager pixels with valid cloud top temperature values or if the corresponding single layer or both multilayer area percent coverage is set to 0 or CERES default, this variable is set to CERES default.

Based on the phase, effective cloud temperature, and the cloud emissivity, cloud retrieval uses a set of empirical formulae to compute the emissivity relative to the physical top of the cloud rather than to the effective height of the cloud. This cloud-top emissivity is used to compute an estimate of cloud-top radiance using the clear-sky and observed radiances. Cloud-top radiance is

converted to cloud-top temperature using the inverse Planck function. The tops of clouds with large emissivities (> 0.99) are assumed to be the same as the cloud effective height. Cloud top temperature is not calculated at night.

SSF-114g Mean cloud top height for multilayer

PSF-weighted mean cloud top height derived from imager radiances that fall within the CERES FOV and over single and multi-layer clouds. (km) [0 .. 20]], i.e. sum of the area of (1), (2), (3), and (4) discussed above.

The bin-averaged values are weighted by the imager pixel fraction of corresponding layer imager pixels to total imager pixels and PSF. If there are no imager pixels with valid cloud top pressure values or if the corresponding single layer or both multilayer area percent coverage is set to 0 or CERES default, this variable is set to CERES default.

Based on the phase, effective cloud temperature, and the cloud emissivity, cloud retrieval uses a set of empirical formulae to compute the emissivity relative to the physical top of the cloud rather than to the effective height of the cloud. This cloud-top emissivity is used to compute an estimate of cloud-top radiance using the clear-sky and observed radiances. Cloud-top radiance is converted to cloud-top temperature using the inverse Planck function. The temperature and height profiles from reanalysis (MOA) are linearly interpolated, and the height value that corresponds to the cloud-top temperature is selected. The tops of clouds with large emissivities (> 0.99) are assumed to be the same as the cloud effective height. Cloud top height is not calculated at night.

SSF-114h Mean cloud effective pressure for multilayer

PSF-weighted mean cloud top pressure derived from imager radiances that fall within the CERES FOV and over single and multi-layer clouds. (km) [0 .. 1100]], i.e. sum of the area of (1), (2), (3), and (4) discussed above.

The bin-averaged values are weighted by the imager pixel fraction of corresponding layer imager pixels to total imager pixels and PSF. If there are no imager pixels with valid cloud top temperature values or if the corresponding single layer or both multilayer area percent coverage is set to 0 or CERES default, this variable is set to CERES default.

The temperature and height profiles from reanalysis are linearly interpolated, and the height value that corresponds to the cloud effective temperature is determined. The cloud effective pressure is obtained from the cloud height using the vertical pressure profile from reanalysis.

SSF-114i Mean cloud effective temperature for multilayer

PSF-weighted mean effective temperature derived from imager radiances that fall within the CERES FOV and over single and multi-layer clouds. (K) [100 .. 350]], i.e. sum of the area of (1), (2), (3), and (4) discussed above.

The bin-averaged values are weighted by the imager pixel fraction of corresponding layer imager pixels to total imager pixels and PSF. If there are no imager pixels with valid cloud effective

temperature values or if the corresponding single layer or both multilayer area percent coverage is set to 0 or CERES default, this variable is set to CERES default.

Cloud effective temperature is the equivalent blackbody temperature of the cloud as seen from above. The temperature of the cloud generally decreases with increasing (decreasing) height (pressure). Thus, the radiation intensity from different layers of a cloud varies with temperature. An integration of that radiation over the cloud thickness, including the attenuation of radiation from lower parts of the cloud by the upper layers, defines the effective temperature. That temperature corresponds to some location between the cloud base and top. Cloud retrieval obtains cloud effective temperature for each pixel first by removing the effects of the atmosphere and any contribution of the surface to the observed 10.8- μm radiance and then using the inverse Planck function to convert the adjusted radiance to temperature.

SSF-114j Mean cloud effective height for multilayer

PSF-weighted mean effective height derived from imager radiances that fall within the CERES FOV and over single and multi-layer clouds. (km) [0 .. 20]], i.e. sum of the area of (1), (2), (3), and (4) discussed above.

The bin-averaged values are weighted by the imager pixel fraction of corresponding layer imager pixels to total imager pixels and PSF. If there are no imager pixels with valid cloud effective height values or if the corresponding single layer or both multilayer area percent coverage is set to 0 or CERES default, this variable is set to CERES default.

Cloud retrieval assigns cloud effective height to each cloudy imager pixels by linearly interpolating to the calculated cloud effective temperature for multilayer (See SSF-11) using the temperature and height vertical profiles from reanalysis (MOA).

SSF-114k Mean cloud base pressure for multilayer

PSF-weighted mean cloud base pressure empirically derived imager radiances that fall within the CERES FOV and over single and multi-layer clouds. (hPa) [0 .. 1100]], i.e. sum of the area of (1), (2), (3), and (4) discussed above.

The bin-averaged values are weighted by the imager pixel fraction of corresponding layer imager pixels to total imager pixels and PSF. If there are no imager pixels with valid cloud base pressure values or if the corresponding single layer or both multilayer area percent coverage is set to 0 or CERES default, this variable is set to CERES default.

Cloud retrieval obtains cloud thickness from the effective temperature and the logarithm of the optical depth for clouds colder than 245 K. For warm clouds (temperature greater than 275 K), the thickness is related to the square root of the optical depth. For clouds between these temperatures, a linear interpolation between the thickness at the two extremes is performed. The minimum cloud thickness is 100 meters. The thickest cloud is limited by the maximum cloud height. Clouds must be a minimum of 100 meters above the surface. The cloud base height is obtained by subtracting the cloud thickness from the cloud height. The cloud bottom pressure is obtained from the cloud base height. Cloud base pressure is not calculated at night.

Table 1.0-15. Multilayer Cloud Footprint Area

Item	SDS Name (Variable Name)	Units	Range	Dimensions	Data Type	Maximum Hourly Size (MB)
SSF-114a (135)	Single layer/multilayer percent coverages	N/A	0 .. 100	n x 4 x 4	4-bytes real	1.6
SSF-114b (136)	Mean visible optical depth for multilayer	N/A	0 .. 400	n x 4 x 4	4-bytes real	1.6
SSF-114c (137)	Mean logarithm of visible optical depth for multilayer	N/A	-6 .. 6	n x 4 x 4	4-bytes real	1.6
SSF-114d (138)	Mean cloud infrared emissivity for multilayer	N/A	0 .. 2	n x 4 x 4	4-bytes real	1.6
SSF-114e (139)	Mean cloud top pressure for multilayer	hPa	0 .. 1100	n x 4 x 4	4-bytes real	1.6
SSF-114f (140)	Mean cloud top temperature for multilayer	K	100 .. 350	n x 4 x 4	4-bytes real	1.6
SSF-114g (141)	Mean cloud top height for multilayer	km	0 .. 20	n x 4 x 4	4-bytes real	1.6
SSF-114h (142)	Mean cloud effective pressure for multilayer	hPa	0 .. 1100	n x 4 x 4	4-bytes real	1.6
SSF-114i (143)	Mean cloud effective temperature for multilayer	K	100 .. 350	n x 4 x 4	4-bytes real	1.6
SSF-114j (144)	Mean cloud effective height for multilayer	km	0 .. 20	n x 4 x 4	4-bytes real	1.6
SSF-114k (145)	Mean cloud base pressure for multilayer	hPa	0 .. 1100	n x 4 x 4	4-bytes real	1.6

Second dimensional index of variable in Tabel 1.0-16.

Wavelength indicated by SSF-115.

Third (or second index)

1. Imager radiance averaged over the entire CERES footprint
2. Imager radiances averaged only along the ground track

Table 1.0-16. Imager radiance along ground track

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Daily Size (MB)
SSF-115 (146)	Imager channel central wavelength	μm	0.4 .. 15.0	n x 5	4-bytes real	0.5
SSF-116 (147)	All subpixel clear area percent coverage	N/A	0 .. 100	n x 2	4-bytes real	0.2
SSF-117 (148)	All subpixel overcast cloud area percent coverage	N/A	0 .. 100	n x 2	4-bytes real	0.2
SSF-118 (149)	Mean imager radiances over clear area	$\text{W m}^{-2} \text{ sr}^{-1} \mu\text{m}^{-1}$	-1000 .. 1000	n x 2 x 5	4-bytes real	1.0
SSF-119 (150)	Stddev of imager radiances over clear area	$\text{W m}^{-2} \text{ sr}^{-1} \mu\text{m}^{-1}$	0 .. 1000	n x 2 x 5	4-bytes real	1.0
SSF-120 (151)	Mean imager radiances over overcast cloud area	$\text{W m}^{-2} \text{ sr}^{-1} \mu\text{m}^{-1}$	-1000 .. 1000	n x 2 x 5	4-bytes real	1.0
SSF-121 (152)	Stddev of imager radiances over overcast cloud area	$\text{W m}^{-2} \text{ sr}^{-1} \mu\text{m}^{-1}$	0 .. 1000	n x 2 x 5	4-bytes real	1.0
SSF-122 (153)	Mean imager radiances over full CERES FOV	$\text{W m}^{-2} \text{ sr}^{-1} \mu\text{m}^{-1}$	-1000 .. 1000	n x 2 x 5	4-bytes real	1.0
SSF-123 (154)	Stddev of imager radiances over full CERES FOV	$\text{W m}^{-2} \text{ sr}^{-1} \mu\text{m}^{-1}$	0 .. 1000	n x 2 x 5	4-bytes real	1.0
SSF-126 (155)	Mean imager radiances over cloud layer 1 (no overlap)	$\text{W m}^{-2} \text{ sr}^{-1} \mu\text{m}^{-1}$	-1000 .. 1000	n x 2 x 5	4-bytes real	1.0
SSF-127 (156)	Stddev of imager radiances over cloud layer 1 (no overlap)	$\text{W m}^{-2} \text{ sr}^{-1} \mu\text{m}^{-1}$	0 .. 1000	n x 2 x 5	4-bytes real	1.0
SSF-128 (157)	Mean imager radiances over cloud layer 2 (no overlap)	$\text{W m}^{-2} \text{ sr}^{-1} \mu\text{m}^{-1}$	-1000 .. 1000	n x 2 x 5	4-bytes real	1.0
SSF-129 (158)	Stddev of imager radiances over cloud layer 2 (no overlap)	$\text{W m}^{-2} \text{ sr}^{-1} \mu\text{m}^{-1}$	0 .. 1000	n x 2 x 5	4-bytes real	1.0
SSF-130 (159)	Mean imager radiances over cloud layer 1 and 2 overlap	$\text{W m}^{-2} \text{ sr}^{-1} \mu\text{m}^{-1}$	-1000 .. 1000	n x 2 x 5	4-bytes real	1.0
SSF-131 (160)	Stddev of imager radiances over cloud layer 1 and 2 overlap	$\text{W m}^{-2} \text{ sr}^{-1} \mu\text{m}^{-1}$	0 .. 1000	n x 2 x 5	4-bytes real	1.0
SSF-131a (161)	Additional imager channel central wavelength	μm	0.4 .. 15.0	n x 2 x 7	4-bytes real	1.4
SSF-131b (162)	Additional mean imager radiances over clear area	$\text{W m}^{-2} \text{ sr}^{-1} \mu\text{m}^{-1}$	-1000 .. 1000	n x 2 x 7	4-bytes real	1.4
SSF-131c (163)	Additional stddev of imager radiances over clear area	$\text{W m}^{-2} \text{ sr}^{-1} \mu\text{m}^{-1}$	0 .. 1000	n x 2 x 7	4-bytes real	1.4

Table 1.0-16. Imager radiance along ground track

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Daily Size (MB)
SSF-131d (164)	Additional mean imager radiances over full CERES FOV	$W\ m^{-2}\ sr^{-1}\ \mu m^{-1}$	-1000 .. 1000	n x 2 x 7	4-bytes real	1.4
SSF-131e (165)	Additional stddev of imager radiances over full CERES FOV	$W\ m^{-2}\ sr^{-1}\ \mu m^{-1}$	0 .. 1000	n x 2 x 7	4-bytes real	1.4

Second index of variables in Table 1.0-17.

1. Properties averaged over the entire CERES footprint
2. Properties averaged only along the ground track

Note: SSF-133, SSF-147, MOD04 cloud fraction is the fraction of pixels used to retrieve aerosol optical thickness. CERES get the fraction over a 10 km by 10 km area. The same cloud fraction is assigned to all pixels in a 10 km by 10 km area. Pixels within a CERES footprint are then weighted by PSF and averaged.

Table 1.0-17. MODIS Land Aerosols

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Daily Size (MB)
SSF-132 (166)	Percentage of CERES FOV with MODIS land aerosol	N/A	0 .. 100	n x 2	2-bytes int	0.1
SSF-133 (167)	PSF-wtd MOD04 cloud fraction land	N/A	0 .. 100	n x 2	2-bytes int	0.1
SSF-134 (168)	PSF-wtd MOD04 aerosol types land	N/A	0 .. 9999	n x 2	4-bytes int	0.2
SSF-135 (169)	PSF-wtd MOD04 dust weighting factor land	N/A	0.0 .. 1.0	n x 2	4-bytes real	0.2
SSF-136 (170)	PSF-wtd MOD04 corrected optical depth land (0.470)	N/A	0.0 .. 5.0	n x 2	4-bytes real	0.2
SSF-137 (171)	PSF-wtd MOD04 corrected optical depth land (0.550)	N/A	0.0 .. 5.0	n x 2	4-bytes real	0.2
SSF-138 (172)	PSF-wtd MOD04 corrected optical depth land (0.659)	N/A	0.0 .. 5.0	n x 2	4-bytes real	0.2

SSF-139 (173)	MOD04 number pixels percentile land (0.659) in CERES FOV	N/A	0 .. ($2^{31}-1$)	n x 2	4-bytes int	0.2
SSF-140 (174)	PSF-wtd MOD04 mean reflectance land (0.470)	N/A	0.0 .. 1.0	n x 2	4-bytes real	0.2
SSF-141 (175)	PSF-wtd MOD04 mean reflectance land (0.659)	N/A	0.0 .. 1.0	n x 2	4-bytes real	0.2
SSF-142 (176)	PSF-wtd MOD04 mean reflectance land (0.865)	N/A	0.0 .. 1.0	n x 2	4-bytes real	0.2
SSF-143 (177)	PSF-wtd MOD04 mean reflectance land (2.130)	N/A	0.0 .. 1.0	n x 2	4-bytes real	0.2
SSF-144 (178)	PSF-wtd MOD04 mean reflectance land (3.750)	N/A	0.0 .. 1.0	n x 2	4-bytes real	0.2
SSF-145 (179)	PSF-wtd MOD04 std reflectance land (0.470)	N/A	0.0 .. 2.0	n x 2	4-bytes real	0.2

Table 1.0-18. MODIS Ocean Aerosols

Item	SDS Name (Variable Name)	Units	Range	Dimensions	Data Type	Maximum Daily Size (MB)
SSF-146 (180)	Percentage of CERES FOV with MODIS ocean aerosol	N/A	0 .. 100	n x 2	2-bytes int	0.1
SSF-147 (181)	PSF-wtd MOD04 cloud fraction ocean	N/A	0 .. 100	n x 2	2-bytes int	0.1
SSF-148 (182)	PSF-wtd MOD04 solution indices ocean small, average	N/A	0 .. 99999	n x 2	4-bytes int	0.2
SSF-149 (183)	PSF-wtd MOD04 solution indices ocean large, average	N/A	0 .. 99999	n x 2	4-bytes int	0.2
SSF-150 (184)	PSF-wtd MOD04 effective optical depth average ocean (0.470)	N/A	0.0 .. 5.0	n x 2	4-bytes real	0.2
SSF-151 (185)	PSF-wtd MOD04 effective optical depth average ocean (0.550)	N/A	0.0 .. 5.0	n x 2	4-bytes real	0.2
SSF-152 (186)	PSF-wtd MOD04 effective optical depth average ocean (0.659)	N/A	0.0 .. 5.0	n x 2	4-bytes real	0.2
SSF-153 (187)	PSF-wtd MOD04 effective optical depth average ocean (0.865)	N/A	0.0 .. 5.0	n x 2	4-bytes real	0.2
SSF-154 (188)	PSF-wtd MOD04 effective optical depth average ocean (1.240)	N/A	0.0 .. 5.0	n x 2	4-bytes real	0.2
SSF-155 (189)	PSF-wtd MOD04 effective optical depth average ocean (1.640)	N/A	0.0 .. 5.0	n x 2	4-bytes real	0.2
SSF-156 (190)	PSF-wtd MOD04 effective optical depth average ocean (2.130)	N/A	0.0 .. 5.0	n x 2	4-bytes real	0.2

Table 1.0-18. MODIS Ocean Aerosols

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Daily Size (MB)
SSF-157 (191)	PSF-wtd MOD04 optical depth small average ocean (0.550)	N/A	0.0 .. 5.0	n x 2	4-bytes real	0.2
SSF-158 (192)	PSF-wtd MOD04 optical depth small average ocean (0.865)	N/A	0.0 .. 5.0	n x 2	4-bytes real	0.2
SSF-159 (193)	PSF-wtd MOD04 optical depth small average ocean (2.130)	N/A	0.0 .. 5.0	n x 2	4-bytes real	0.2
SSF-160 (194)	PSF-wtd MOD04 cloud condensation nuclei ocean, average	CCN cm ⁻²	0.0 .. 1*10 ¹⁰	n x 2	4-bytes real	0.2
SSF-161 (195)	PSF-wtd MOD04 mean reflectance ocean (0.470)	N/A	0.0 .. 1.0	n x 2	4-bytes real	0.2
SSF-162 (196)	PSF-wtd MOD04 mean reflectance ocean (0.555)	N/A	0.0 .. 1.0	n x 2	4-bytes real	0.2
SSF-163 (197)	PSF-wtd MOD04 mean reflectance ocean (0.659)	N/A	0.0 .. 1.0	n x 2	4-bytes real	0.2
SSF-164 (198)	PSF-wtd MOD04 mean reflectance ocean (0.865)	N/A	0.0 .. 1.0	n x 2	4-bytes real	0.2
SSF-165 (199)	PSF-wtd MOD04 mean reflectance ocean (1.240)	N/A	0.0 .. 1.0	n x 2	4-bytes real	0.2
SSF-166 (200)	PSF-wtd MOD04 mean reflectance ocean (1.640)	N/A	0.0 .. 1.0	n x 2	4-bytes real	0.2
SSF-167 (201)	PSF-wtd MOD04 mean reflectance ocean (2.130)	N/A	0.0 .. 1.0	n x 2	4-bytes real	0.2

Table 1.0-19. CERES Surface Map

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Daily Size (MB)
SSF-24 (24)	Altitude of surface above sea level	m	-1000 .. 10000	n x 2	4-bytes real	0.2
SSF-25 (25)	Surface type index	N/A	1 .. 20	n x 2 x 8	2-bytes int	0.8
SSF-26 (26)	Surface type percent coverage	N/A	0 .. 100	n x 2 x 8	2-bytes int	0.8

Table 1.0-20. Surface Type

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Daily Size (MB)
SSF-27 (27)	CERES SW ADM type for inversion process	N/A	0 .. 5000	n	2-bytes int	0.05
SSF-28 (28)	CERES LW ADM type for inversion process	N/A	0 .. 5000	n	2-bytes int	0.05
SSF-29 (29)	Cloud Classification	N/A	0 .. 32766	n	2-bytes int	0.05
SSF-30 (30)	Snow/ice percent coverage clear-sky overhead-sun vis albedo	N/A	0 .. 9999	n	2-bytes int	0.05

Table 1.0-21. Filtered Radiances

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Daily Size (MB)
SSF-31 (31)	CERES TOT filtered radiance - upwards	$W m^{-2} sr^{-1}$	0 .. 700	n	4-bytes real	0.1
SSF-32 (32)	CERES SW filtered radiance - upwards	$W m^{-2} sr^{-1}$	-10 .. 510	n	4-bytes real	0.1
SSF-33 (33)	CERES WN filtered radiance - upwards	$W m^{-2} sr^{-1} \mu m^{-1}$	0 .. 15	n	4-bytes real	0.1
SSF-34 (34)	Radiance and Mode flags	N/A	0 .. ($2^{31}-1$)	n	4-bytes int	0.1

Table 1.0-22. Unfiltered Radiances

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Daily Size (MB)
SSF-35 (35)	CERES SW radiance - upwards	$W m^{-2} sr^{-1}$	-10 .. 510	n	4-bytes real	0.1
SSF-36 (36)	CERES LW radiance - upwards	$W m^{-2} sr^{-1}$	0 .. 200	n	4-bytes real	0.1
SSF-37 (37)	CERES WN radiance - upwards	$W m^{-2} sr^{-1}$	0 .. 60	n	4-bytes real	0.1

Table 1.0-23. TOA and Surface Fluxes

Item	SDS Name (Variable Name)	Units	Range	Dimensions	Data Type	Maximum Daily Size (MB)
SSF-41 (42)	CERES downward SW surface flux - Model A	W m ⁻²	0 .. 1400	n	4-bytes real	0.1
SSF-42 (43)	CERES downward LW surface flux - Model A	W m ⁻²	0 .. 700	n	4-bytes real	0.1
SSF-43 (44)	CERES downward WN surface flux - Model A	W m ⁻²	0 .. 250	n	4-bytes real	0.1
SSF-44 (45)	CERES net SW surface flux - Model A	W m ⁻²	0 .. 1400	n	4-bytes real	0.1
SSF-45 (46)	CERES net LW surface flux - Model A	W m ⁻²	-250 .. 50	n	4-bytes real	0.1
SSF-46 (47)	CERES downward SW surface flux - Model B	W m ⁻²	0 .. 1400	n	4-bytes real	0.1
SSF-46a (48)	CERES downward SW surface flux - Model B, clearsky	W m ⁻²	0 .. 1400	n	4-bytes real	0.1
SSF-47 (49)	CERES downward LW surface flux - Model B	W m ⁻²	0 .. 700	n	4-bytes real	0.1
SSF-47a (50)	CERES downward LW surface flux - Model B, clearsky	W m ⁻²	0 .. 700	n	4-bytes real	0.1
SSF-48 (51)	CERES net SW surface flux - Model B	W m ⁻²	0 .. 1400	n	4-bytes real	0.1
SSF-49 (52)	CERES net LW surface flux - Model B	W m ⁻²	-250 .. 50	n	4-bytes real	0.1
SSF-49a (53)	CERES downward LW surface flux - Model C	W m ⁻²	0 .. 700	n	4-bytes real	0.1
SSF-49b (54)	CERES downward LW surface flux - Model C, clearsky	W m ⁻²	0 .. 700	n	4-bytes real	0.1
SSF-49c (55)	CERES net LW surface flux - Model C	W m ⁻²	-250 .. 50	n	4-bytes real	0.1
SSF-50 (56)	CERES broadband surface albedo	N/A	0 .. 1	n	4-bytes real	0.1
SSF-51 (57)	CERES LW surface emissivity	N/A	0 .. 1	n	4-bytes real	0.1
SSF-52 (58)	CERES WN surface emissivity	N/A	0 .. 1	n	4-bytes real	0.1

Table 1.0-24. Full Footprint Area

Item	SDS Name (Variable Name)	Units	Range	Dimen- sions	Data Type	Maximum Daily Size (MB)
SSF-53 (59)	Number of imager pixels in CERES FOV	N/A	0 .. 32766	n x 2	2-bytes int	0.05
SSF-54 (60)	Imager percent coverage	N/A	0 .. 100	n x 2	2-bytes int	0.05
SSF-55 (61)	Imager viewing zenith over CERES FOV	deg	0 .. 90	n	4-bytes real	0.1
SSF-56 (62)	Imager relative azimuth over CERES FOV	deg	0 .. 360	n	4-bytes real	0.1
SSF-57 (63)	Surface wind - U-vector	m sec ⁻¹	-100 .. 100	n	4-bytes real	0.1
SSF-58 (64)	Surface wind - V-vector	m sec ⁻¹	-100 .. 100	n	4-bytes real	0.1
SSF-59 (65)	Surface skin temperature	K	175 .. 375	n	4-bytes real	0.1
SSF-59a (66)	Surface pressure	hPa	0 .. 1100	n	4-bytes real	0.1
SSF-60 (67)	Column averaged relative humidity	N/A	0 .. 100	n	4-bytes real	0.1
SSF-60a (68)	Surface minus 750 mb air temperature difference	K	-200 .. 200	n	4-bytes real	0.1
SSF-60b (69)	Estimated Inversion Stability	K	-200 .. 200	n	4-bytes real	0.1
SSF-61 (70)	Precipitable water	cm	0.001 .. 10	n	4-bytes real	0.1
SSF-62 (71)	Flag - Source of precipitable water	N/A	0 .. 120	n	2-bytes int	0.05
SSF-63 (72)	Cloud property extrapolation over cloudy area	N/A	0 .. 100	n	2-bytes int	0.05
SSF-64 (73)	Notes on general procedure	N/A	0 .. 32766	n	2-bytes int	0.05
SSF-65 (74)	Notes on cloud algorithms	N/A	0 .. 32766	n	2-bytes int	0.05
SSF-65a (75)	Additional notes on cloud algorithms	N/A	0 .. 32766	n	2-bytes int	0.05
SSF-65b (76)	Notes on cloud multilayer	N/A	0 .. 32766	n	2-bytes int	0.05

Variables extracted from standard CERES CRS

Table 1.0-25. Surface Radiative Properties

SARB SDS	Terra and Aqua CRS SDS Number ^a	SDS Name	Units	Range	Dim	Data Type	Maximum Daily Size (MB)
1 (202)	Aqua-161	Photosynthetically active radiation over surface	W m ⁻²	0 .. 780	n	4-bytes real	0.1
2 (203)	Aqua-162	Direct/diffuse surface ratio	N/A	0 .. 30	n	4-bytes real	0.1
3 (204)	Terra-163	Corrected initial broadband surface albedo	N/A	0 .. 1	n	4-bytes real	0.1

a. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 1.0-26. Vertical Profile Description

SARB SDS	Terra and Aqua CRS SDS Number ^a	SDS Name	Units	Range	Dim	Data Type	Maximum Daily Size (MB)
4 (205)	Terra-164	Number of atmospheric levels	N/A	0 .. 5	n	4-bytes int	0.1
5 (206)	Terra-165	Pressure levels	hPa	0 .. 1100	n x 5	4-bytes real	0.1

a. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 1.0-27. Pristine Vertical Flux Profiles

SARB SDS	Terra and Aqua CRS SDS Number ^a	SDS Name	Units	Range	Dim	Data Type	Maximum Daily Size (MB)
6 (207)	Terra-166	Shortwave flux - upward - pristine	W m ⁻²	0 .. 1400	n x 2	4-bytes real	0.2
7 (208)	Terra-167	Shortwave flux - downward - pristine	W m ⁻²	0 .. 1400	n x 2	4-bytes real	0.2
8 (209)	Terra-168	Longwave flux - upward - pristine	W m ⁻²	0 .. 850	n x 2	4-bytes real	0.2
9 (210)	Terra-169	Longwave flux - downward - pristine	W m ⁻²	0 .. 700	n x 2	4-bytes real	0.2
10 (211)	Terra-170	Window channel flux - upward - pristine	W m ⁻²	0 .. 370	n x 2	4-bytes real	0.2
11 (212)	Terra-171	Window channel flux - downward - pristine	W m ⁻²	0 .. 370	n x 2	4-bytes real	0.2

Second dimensional index 1 = TOA, 2 = surface.

a. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

The second dimensional index of variable in tables 1.0-28 and 1.0-29

1 = TOA

2 = 70 hPa

3 = 200 hPa

4 = 500 hPa

5 = Surface

Table 1.0-28. Constrained Clear Sky Profiles

SARB SDS	Terra and Aqua CRS SDS Number ^a	SDS Name	Units	Range	Dim	Data Type	Maximum Daily Size (MB)
12 (213)	Terra-172	Shortwave flux - upward - clear	W m ⁻²	0 .. 1400	n x 5	4-bytes real	0.5
13 (214)	Terra-173	Shortwave flux - downward - clear	W m ⁻²	0 .. 1400	n x 5	4-bytes real	0.5
14 (215)	Terra-174	Longwave flux - upward - clear	W m ⁻²	0 .. 850	n x 5	4-bytes real	0.5
15 (216)	Terra-175	Longwave flux - downward - clear	W m ⁻²	0 .. 700	n x 5	4-bytes real	0.5
16 (217)	Terra-176	Window channel flux - upward - clear	W m ⁻²	0 .. 370	n x 5	4-bytes real	0.5
17 (218)	Terra-177	Window channel flux - downward - clear	W m ⁻²	0 .. 370	n x 5	4-bytes real	0.5

a. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 1.0-29. Constrained Total Sky Profiles

SARB SDS	Terra and Aqua CRS SDS Number ^a	SDS Name	Units	Range	Dim	Data Type	Maximum Daily Size (MB)
18 (219)	Terra-178	Shortwave flux - upward - total	W m ⁻²	0 .. 1400	n x 5	4-bytes real	0.5
19 (220)	Terra-179	Shortwave flux - downward - total	W m ⁻²	0 .. 1400	n x 5	4-bytes real	0.5
20 (221)	Terra-180	Longwave flux - upward - total	W m ⁻²	0 .. 850	n x 5	4-bytes real	0.5
21 (222)	Terra-181	Longwave flux - downward - total	W m ⁻²	0 .. 700	n x 5	4-bytes real	0.5
22 (223)	Terra-182	Window channel flux - upward - total	W m ⁻²	0 .. 370	n x 5	4-bytes real	0.5
23 (224)	Terra-183	Window channel flux - downward - total	W m ⁻²	0 .. 370	n x 5	4-bytes real	0.5

a. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Adjustment in Tables 1.0-30, 1.0-31, and 1.0-32 are defined as
 Untune irradiance = Tuned irradiance – adjustment.

Table 1.0-30. Pristine Constraint-Initial Flux Deltas

SARB SDS	Terra and Aqua CRS SDS Number ^a	SDS Name	Units	Range	Dim	Data Type	Maximum Daily Size (MB)
24 (225)	Terra-184	Shortwave flux adjustment at surface - upward - pristine	W m ⁻²	-1400 .. 1400	n	4-bytes real	0.1
25 (226)	Terra-185	Shortwave flux adjustment at TOA - upward - pristine	W m ⁻²	-1400 .. 1400	n	4-bytes real	0.1
26 (227)	Terra-186	Shortwave flux adjustment at surface - downward - pristine	W m ⁻²	-1400 .. 1400	n	4-bytes real	0.1
27 (228)	Terra-187	Longwave flux adjustment at surface - upward - pristine	W m ⁻²	-600 .. 600	n	4-bytes real	0.1
28 (229)	Terra-188	Longwave flux adjustment at surface - downward - pristine	W m ⁻²	-700 .. 700	n	4-bytes real	0.1
29 (230)	Terra-189	Longwave flux adjustment at TOA - upward - pristine	W m ⁻²	-700 .. 700	n	4-bytes real	0.1
30 (231)	Terra-190	Window channel flux adjustment at surface - upward - pristine	W m ⁻²	-50 .. 50	n	4-bytes real	0.1
31 (232)	Terra-191	Window channel flux adjustment at surface - downward - pristine	W m ⁻²	-50 .. 50	n	4-bytes real	0.1
32 (233)	Terra-192	Window channel flux adjustment at TOA - upward - pristine	W m ⁻²	-50 .. 50	n	4-bytes real	0.1

a. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 1.0-31. Clear Sky Constraint-Initial Flux Deltas

SARB SDS	Terra and Aqua CRS SDS Number ^a	SDS Name	Units	Range	Dim	Data Type	Maximum Daily Size (MB)
33 (234)	Terra-193	Shortwave flux adjustment at surface - upward for clear-sky	W m ⁻²	-1400 .. 1400	n	4-bytes real	0.1
34 (235)	Terra-194	Shortwave flux adjustment at TOA - upward for clear-sky	W m ⁻²	-1400 .. 1400	n	4-bytes real	0.1
35 (236)	Terra-195	Shortwave flux adjustment at surface - downward for clear-sky	W m ⁻²	-1400 .. 1400	n	4-bytes real	0.1
36 (237)	Terra-196	Longwave flux adjustment at surface - upward for clear-sky	W m ⁻²	-600 .. 600	n	4-bytes real	0.1
37 (238)	Terra-197	Longwave flux adjustment at surface - downward for clear-sky	W m ⁻²	-700 .. 700	n	4-bytes real	0.1
38 (239)	Terra-198	Longwave flux adjustment at TOA - upward for clear-sky	W m ⁻²	-700 .. 700	n	4-bytes real	0.1
39 (240)	Terra-199	Window channel flux adjustment at surface - upward for clear-sky	W m ⁻²	-50 .. 50	n	4-bytes real	0.1
40 (241)	Terra-200	Window channel flux adjustment at surface - downward - clear	W m ⁻²	-50 .. 50	n	4-bytes real	0.1
41 (242)	Terra-201	Window channel flux adjustment at TOA - upward - clear	W m ⁻²	-50 .. 50	n	4-bytes real	0.1

a. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 1.0-32. Total Sky Constraint-Initial Flux Deltas

SARB SDS	Terra and Aqua CRS SDS Number ^a	SDS Name	Units	Range	Dim	Data Type	Maximum Daily Size (MB)
42 (243)	Terra-202	Shortwave flux adjustment at surface - upward - total	W m ⁻²	-1400 .. 1400	n	4-bytes real	0.1
43 (244)	Terra-203	Shortwave flux adjustment at TOA - upward - total	W m ⁻²	-1400 .. 1400	n	4-bytes real	0.1
44 (245)	Terra-204	Shortwave flux adjustment at surface - downward - total	W m ⁻²	-1400 .. 1400	n	4-bytes real	0.1
45 (246)	Terra-205	Longwave flux adjustment at surface - upward - total	W m ⁻²	-600 .. 600	n	4-bytes real	0.1
46 (247)	Terra-206	Longwave flux adjustment at surface - downward - total	W m ⁻²	-700 .. 700	n	4-bytes real	0.1
47 (248)	Terra-207	Longwave flux adjustment at TOA - upward - total	W m ⁻²	-700 .. 700	n	4-bytes real	0.1
48 (249)	Terra-208	Window channel flux adjustment at surface - upward - total	W m ⁻²	-50 .. 50	n	4-bytes real	0.1
49 (250)	Terra-209	Window channel flux adjustment at surface - downward - total	W m ⁻²	-50 .. 50	n	4-bytes real	0.1
50 (251)	Terra-210	Window channel flux adjustment at TOA - upward - total	W m ⁻²	-50 .. 50	n	4-bytes real	0.1

a. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 1.0-33. Satellite Emulated Window Channel

SARB SDS	Terra and Aqua CRS SDS Number ^a	SDS Name	Units	Range	Dim	Data Type	Maximum Daily Size (MB)
51 (252)	Terra-211	Window channel filtered radiance -satellite emulated	W m ⁻² sr ⁻¹	0 .. 50	n	4-bytes real	0.1
52 (253)	Terra-212	Window channel filtered radiance adjustment-satellite emulated	W m ⁻² sr ⁻¹	0 .. 50	n	4-bytes real	0.1
53 (254)	Terra-213	Window channel flux - satellite emulated - TOA	W m ⁻²	2 .. 50	n	4-bytes real	0.1
54 (255)	Terra-214	Window channel flux adjustment - satellite emulated - TOA	W m ⁻²	2 .. 50	n	4-bytes real	0.1

a. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 1.0-34. Unfiltered Total Longwave

SARB SDS	Terra and Aqua CRS SDS Number ^a	SDS Name	Units	Range	Dim	Data Type	Maximum Daily Size (MB)
55 (256)	Terra-215	Total Longwave unfiltered radiance - satellite emulated	W m ⁻² sr ⁻¹	0 .. 200	n	4-bytes real	0.1
56 (257)	Terra-216	Total Longwave unfiltered radiance adjustment - satellite emulated	W m ⁻² sr ⁻¹	0 .. 200	n	4-bytes real	0.1

a. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 1.0-35. Constraint Adjustments

SARB SDS	Terra and Aqua CRS SDS Number ^a	SDS Name	Units	Range	Dim	Data Type	Maximum Daily Size (MB)
57 (258)	Terra-217	Total column precipitable water - initial	cm	0 .. 10	n	4-bytes real	0.1
58 (259)	Terra-218	Total column precipitable water - adjustment	cm	-10 .. 10	n	4-bytes real	0.1
59 (260)	Terra-219	Upper tropospheric precipitable water - initial	cm	0 .. 10	n	4-bytes real	0.1
60 (261)	Terra-220	Upper tropospheric precipitable water - adjustment	cm	-10 .. 10	n	4-bytes real	0.1
61 (262)	Terra-221	Upper tropospheric humidity - initial	N/A	0.0 .. 100.0	n	4-bytes real	0.1
62 (263)	Terra-222	Upper tropospheric humidity - adjustment	N/A	0.0 .. 100.0	n	4-bytes real	0.1
63 (264)	Terra-223	Surface albedo - adjustment	N/A	-1 .. 1	n	4-bytes real	0.1
64 (265)	Terra-224	Aerosol optical depth - initial	N/A	0 .. 2	n	4-bytes real	0.1
65 (266)	Terra-225	Aerosol optical depth - adjustment	N/A	-2 .. 2	n	4-bytes real	0.1
66 (267)	Terra-226	Skin temperature - initial	K	TBD	n	4-bytes real	0.1
67 (268)	Terra-227	Skin temperature - adjustment	K	TBD	n	4-bytes real	0.1
68 (269)	Terra-228	Mean visible optical depth- adjustment	N/A	-400 .. 400	n x 2	4-bytes real	0.2
69 (270)	Terra-229	Mean cloud fractional area - adjustment	N/A	-1 .. 1	n x 2	4-bytes real	0.2
70 (271)	Terra-230	Mean cloud effective temperature - adjustment	K	TBD	n x 2	4-bytes real	0.2

a. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 1.0-36. Aerosol Constituency Information

SARB SDS	Terra and Aqua CRS SDS Number ^a	SDS Name	Units	Range	Dim	Data Type	Maximum Daily Size (MB)
71 (272)	Terra-231	Aerosol constituency flags	N/A	01000000 .. 18999999	n x 7	4-bytes int	0.7
72 (273)	Terra-232	Surface albedo and aerosol sources flag	N/A	100 - 303	n	4-bytes int	0.1

a. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 1.0-37. Constraint Status

SARB SDS	Terra and Aqua CRS SDS Number ^a	SDS Name	Units	Range	Dim	Data Type	Maximum Daily Size (MB)
73 (274)	Terra-233	Number of tuning iterations	N/A	0 .. 1	n	4-bytes int	0.1
74 (275)	Terra-234	Constraint status flag	N/A	0 .. 600	n	4-bytes int	0.1
75 (276)	Terra-235	FuLiou model error code	N/A	1 .. 3000	n	4-bytes int	0.1

a. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 1.0-38. Cloudy Skies with No Aerosol Information

SARB SDS	Terra and Aqua CRS SDS Number ^a	SDS Name	Units	Range	Dim	Data Type	Maximum Daily Size (MB)
76 (277)	Terra-236	Shortwave flux - upward - cloudy sky : no aerosol	W m ⁻²	0 .. 1400	n	4-bytes real	0.1
77 (278)	Terra-237	Shortwave flux - downward - cloudy sky : no aerosol	W m ⁻²	0 .. 1400	n	4-bytes real	0.1
78 (279)	Terra-238	Longwave flux - upward - cloudy sky : no aerosol	W m ⁻²	0 .. 850	n	4-bytes real	0.1
79 (280)	Terra-239	Longwave flux - downward - cloudy sky : no aerosol	W m ⁻²	0 .. 700	n	4-bytes real	0.1
80 (281)	Terra-240	Window channel flux - upward - cloudy sky : no aerosol	W m ⁻²	0 .. 370	n	4-bytes real	0.1
81 (282)	Terra-241	Window channel flux - downward - cloudy sky : no aerosol	W m ⁻²	0 .. 370	n	4-bytes real	0.1
82 (283)	Terra-242	Shortwave flux adjustment at surface - upward - cloudy sky : no aerosol	W m ⁻²	-1400 .. 1400	n	4-bytes real	0.1
83 (284)	Terra-243	Shortwave flux adjustment at TOA - upward - cloudy sky : no aerosol	W m ⁻²	-1400 .. 1400	n	4-bytes real	0.1

84 (285)	Terra-244	Shortwave flux adjustment at surface - downward - cloudy sky : no aerosol	$W m^{-2}$	-1400 .. 1400	n	4-bytes real	0.1
85 (286)	Terra-245	Longwave flux adjustment at surface - upward - cloudy sky : no aerosol	$W m^{-2}$	-600 .. 600	n	4-bytes real	0.1
86 (287)	Terra-246	Longwave flux adjustment at surface - downward - cloudy sky : no aerosol	$W m^{-2}$	-700 .. 700	n	4-bytes real	0.1
87 (288)	Terra-247	Longwave flux adjustment at TOA - upward - cloudy sky : no aerosol	$W m^{-2}$	-700 .. 700	n	4-bytes real	0.1
88 (289)	Terra-248	Window channel flux adjustment at surface - upward - cloudy sky : no aerosol	$W m^{-2}$	-50 .. 50	n	4-bytes real	0.1
89 (290)	Terra-249	Window flux adjustment at surface - downward - cloudy sky : no aerosol	$W m^{-2}$	-50 .. 50	n	4-bytes real	0.1
90 (291)	Terra-250	Window channel flux adjustment at TOA - upward - cloudy sky : no aerosol	$W m^{-2}$	-50 .. 50	n	4-bytes real	0.1

a. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Estimated MegaBytes / Day:

CCCM cloud and aerosols variables	492
CCCM flux variables	463
Standard SSF+CRS nadir view only	

